THE POLAR RECORD

VOL. 9, NO. 58, JANUARY 1958

149

A Journal of Arctic and Antarctic Exploration and Research

Issued by the Scott Polar Research Institute, Cambridge

6s. 6d.

INDEX

The index and title page of the *Polar Record*, Vol. 7, Nos. 47-51, 1954-55, are now available, price 10*s*., from the Scott Polar Research Institute, Cambridge.

THE POLAR RECORD

Editor: L. M. Forbes. Editorial Committee: B. B. Roberts, J. A. Steers, J. M. Wordie

Vol. 9 January, 1958 No. 58

CONTENTS

FOREWORD . . . . . *page* 2

ARTICLES:

Geological investigations in the Falkland Islands Dependencies since 1940. By Raymond J. Adie 3
Ice bridges. By Major P. J. Carson, R.E. 18
Sledge-boats. By J. H. Exley 20

FIELD WORK:

Activities of the Arctic Islands Section, Geological Survey of Canada, 1956 23
Swedish–Finnish–Swiss International Geophysical Year Expedition to Nordaustlandet, 1957–58: Operations in 1957 24
International Glaciological Expedition to Greenland, 1957–60: Operations in 1957 25
Canadian Operation "Hazen", 1957 26
South Georgia Survey, 1956–57 27
Falkland Islands and Dependencies Aerial Survey Expedition, 1955–57: Operations in 1956–57 28

NOTES:

The area and distribution of glaciers in the Arctic 32
Research on anti-icing precautions for ships 36
Ninth meeting of the International Whaling Commission, 1957 . 39
Growth of trees near their northern limit 41
Soviet biological station on the Barents Sea 42
North Pacific Fur Seal Conference, 1955–57 43
Trans-Arctic commercial flights, 1957 49
Exploitation of lead and zinc deposits at Mesters Vig, East Greenland 50
Loss of *Polarbjørn*, 1957 51
New mail-ship for the Falkland Islands 52
Argentine law relating to the Antarctic, 1957 52

OBITUARY 54

RECENT POLAR LITERATURE 59

ERRATA 85

FOREWORD

Rear-Admiral George A. Dufek, U.S.N., has succeeded the late Rear-Admi Richard E. Byrd as Officer-in-Charge, United States Antarctic Programs. T holder of this post, which was created in 1955, has a variety of duties connexion with United States activities in the Antarctic. Rear-Admiral Duf reports to the Secretary of Defence, and through him to the Operations C ordinating Board, on the political, scientific, legislative and operational ac vities which comprise the United States Antarctic Program. He is seni adviser in the preparation of plans and legislation for the implementation United States Antarctic policy, including the establishment of a permane unit for Antarctic activities. He also advises on the technical preparation specific operations and expeditions, and insures that all aspects of these ac vities are properly co-ordinated.

As this issue of the *Polar Record* goes to press the Trans-Antarctic Expediti has left its bases at "Shackleton" and "Scott" and the trans-continen journey is beginning. We wish Dr Fuchs, Sir Edmund Hillary and all memb of the expedition the best of good fortune.

The Scott Polar Research Institute regrets that, owing to increases in t cost of printing, publishing and postage, the price of the *Polar Record* must raised. The present price was fixed in January 1952, and, since then, producti costs have risen by about 25 per cent. Beginning with this issue, the price each issue will be 10*s.* 6*d.* (£1. 11*s.* 6*d.* a year), or $1.75 ($5 a year); both ra include postage.

December 1957

GEOLOGICAL INVESTIGATIONS IN THE FALKLAND ISLANDS DEPENDENCIES SINCE 1940

BY RAYMOND J. ADIE*

[*MS. received 25 October 1957.*]

CONTENTS

Introduction . . .	*page* 3	Graham Land . . .	*page* 6
South Georgia . . .	4	South Orkney Islands . .	13
South Sandwich Islands . .	5	Conclusion	14
South Shetland Islands . .	5		

Introduction

Scientific interest in the Falkland Islands Dependencies was revived after a lapse of some years when Operation "Tabarin"[1] was formed in 1943, under the auspices of the Royal Navy. In spite of severe wartime limitations on equipment, a great deal of fundamental survey and geological work was accomplished during these early years. The Falkland Islands Dependencies Survey (F.I.D.S.),[1–10] which was established in 1946, continued the scientific work of Operation "Tabarin", and since that date it has gradually expanded its scientific activities in the Dependencies. The Survey is now solely responsible for all official British geological investigations undertaken in the Dependencies.

From time to time geologists, unconnected with the Falkland Islands Dependencies Survey, have visited these regions and undertaken local surveys. For instance, during 1946–48 the Ronne Antarctic Research Expedition reoccupied the former United States Antarctic Service Expedition hut on Stonington Island, Marguerite Bay, and R. L. Nichols[11–15] with R. H. T. Dodson made important observations on the solid geology and the geomorphology of this area. They travelled as far south as Alexander Land but conditions prevented them from gaining access to the land.

It is believed that both Chilean and Argentine geologists have visited the Falkland Islands Dependencies since these countries began their Antarctic activities, but it is not yet certain how much field mapping has been completed by them. As yet relatively few reports[16–22] of their geological work in the South Shetland Islands and on the north-west coast of Graham Land have been published.

The initial aim of the Falkland Islands Dependencies Survey was to obtain a broad outline of the general topography and geology over a wide area, and as quickly as possible. Therefore the early work was entirely of a reconnaissance nature. Great distances and areas had to be covered rapidly and this necessitated long and arduous sledge journeys over unexplored country.

* Falkland Islands Dependencies Survey, Department of Geology, University of Birmingham.

Geologists had to spend many months each year in the field working und particularly difficult climatic conditions. However, now that the initial r connaissance surveys have been completed, more detailed geological mappi is being carried out in specific areas, which may yield valuable information

Because the country is often heavily glacier covered a large part of t Falkland Islands Dependencies, especially Graham Land, is particular difficult of access. The waters of the South Shetland Islands and the west coa of Graham Land, north of Marguerite Bay, are generally free of heavy sea i during the summer months and therefore the coastal areas can be reached b ship. Only a few routes across the 7000 ft. plateau of Graham Land are know and therefore the east coast has received less geological attention than t west. Each time a part of the east coast has been surveyed it has meant long and tedious sledge journey from either Hope Bay or Stonington Islan In many areas sledging is impossible and therefore it has been necessary resort to man-hauling and mountaineering techniques.

South Georgia

Although South Georgia had been visited by many of the early Antarct expeditions, and several geologists had had an opportunity to examine par of the island, only the readily accessible coastal parts had been investigate The mountainous spine which forms the core of South Georgia was still ge logically unknown. Previous opinions on the stratigraphic succession, stru ture and tectonics often clashed violently, and the only real basis for agreeme among the geologists was that the geology of South Georgia appeared to both stratigraphically and structurally complex. It seemed essential th sooner or later the geology of this island would have to be revised in the lig of new ideas.

With this as one of its main objectives, the first South Georgia Surv Expedition, 1951–52, was organized, with A. F. Trendall as geologist. It w intended that the coastline should be remapped and then an attempt made penetrate deep into the mountainous areas. Before the end of 1951 Trendal had covered the head of Fortuna Bay and most of the coastline betwe Cumberland East Bay and Royal Bay, but after gaining access to both t Neumayer Glacier and the Ross Glacier areas he fell down a crevasse, and h to return to England for medical treatment.

Because of the low metamorphic grade of the sediments, Trendall direct his attention mainly towards observations on the stratigraphy, conditions sedimentation and micro-structures in the sediments. He concluded the were probably two main sedimentary series—the Sandebugten Series (mai greywacke facies sediments) and the Cumberland Bay Series (coarse-bedd tuffs, younger than the greywackes)—possibly separated by an unconformi On the south-west coast, and on Annenkov Island, he recorded interbedd spilitic lavas and fine-grained sediments; Wilckens had previously describ a collection of Aptian fossils from these, but their precise relationship to t two older series was not accurately known. The presence of the earlier report igneous complex at the south-east end of the island was also confirmed.

Trendall[24] returned to South Georgia in 1953–54 with the second South Georgia Survey Expedition and pursued his previous lines of research, covering most of the island. He soon reached the conclusion that his earlier views on the unconformable relationship between the two older sedimentary "series" were not supported by his field observations. He accordingly introduced the terms "Sandebugten Type" and "Cumberland Bay Type" to cover what he now considered to be two different facies of the same sedimentary succession (about 33,000 ft. thick), which had been deposited under geosynclinal conditions over a long period of time. Although all the rocks of South Georgia exhibit low-grade metamorphic effects, those in the area formerly mapped as "Sandebugten Series" definitely showed more intense deformation than elsewhere.

In addition to describing the spilitic lava sequence of the south-west coast in detail, he clearly established the order of intrusion in the intrusive south-eastern igneous complex, which is responsible for the thermal metamorphism of the surrounding sediments. From studies of both small- and large-scale folding came the solution of the structural evolution of South Georgia. This indicated that the main period of folding was definitely post-Aptian, but still did not solve its relation to the south-eastern intrusive complex.

South Sandwich Islands

This island group has generally been regarded as unsuitable for the establishment of a station, and so far no geological work has been done on them since 1940. Some of the islands are still active volcanoes and in 1956 an eruption was recorded on Bristol Island.

South Shetland Islands

Deception Island is probably the best known island in the South Shetland group, and it was here that one of the first Operation "Tabarin" stations (Base B) was established early in 1944. Following the earlier work of the *Discovery* Investigations and G. W. Tyrrell, W. R. Flett began a detailed survey of this island, but he was unable to complete his field mapping as he was transferred to Hope Bay in 1945. A comprehensive collection of volcanic rocks was made in 1945 by A. Reece, who also made certain additions to the geological map of the island. Since that time the majority of the Falkland Islands Dependencies Survey's geologists have visited Deception Island for short periods and each has indeed made a contribution to our present knowledge of the island. By the end of the 1957–58 summer it is hoped that a detailed survey of the island will be completed.

Deception Island is of particular geological interest, mainly because it represents a Recent volcano in a state of decadence. Although it is clear that volcanism is confined to relatively recent times, it is still not known exactly how many eruptive periods the island has suffered. Recent rock collections indicate that a wide variety of basalts, andesites and volcanics with a decided sodic affinity are present. Xenoliths of Andean intrusives and earlier rocks have been recovered from the volcanics in a highly thermally metamorphosed state. The most important recent discovery is that of fossil shells, similar to

those at present living in the sea surrounding Deception Island, in the volcan agglomerates 200 ft. above sea-level. The hot springs and steam jets, whic issue freely from the volcanic rocks in many places on the island, have als been thoroughly investigated.

A preliminary reconnaissance survey of Mackellar Inlet–Keller Range Martel Inlet in Admiralty Bay, King George Island, was undertaken in 194 by Reece, who discovered carbonized woods in the altered volcanics of th Keller Range. A station (Base G) was established at Admiralty Bay in 194 and E. Platt began a geological survey of the immediate vicinity. The altere acid volcanics of the Keller Range were reported to have a close affinity to th Upper Jurassic volcanics of the Graham Land mainland. These were found t be intruded by quartz-diorites, which were undoubtedly responsible for loc thermal metamorphism of the volcanics. Ternyck Needle and several pr minent outcrops were observed to be old andesitic volcanic spines. Th sudden death of Platt in November 1948 temporarily suspended geologic investigations.

In the following year a field party including geologists D. Jardine an G. Hattersley-Smith sledged round the island and mapped the geology i detail. Many old volcanic vents and dioritic intrusions were mapped and was concluded that faulting, possibly associated with the Andean intrusion was largely responsible for the indented south-east coastline. Jardine studie Penguin Island and the adjacent mainland, which are composed of Pliocen or Pleistocene volcanics that may be contemporaneous with those of Deceptio Island. The north-eastern part of Nelson Island was also examined briefl Of great interest was Hattersley-Smith's discovery of perfectly preserve Tertiary (probably Miocene) plant fossils in the ripple-marked and curren bedded aqueous tuffs. Since that time further fossil plant localities have bee found on the southern side of Ezcurra Inlet and on Dufayel Island.

All the rock collections from King George Island have now been examine in the laboratory by D. D. Hawkes, and the results will be published shortl The fossil plants, which are comparable with those from the Tertiary sed ments of the James Ross Island group, have been studied by O. Selling, an the results are now ready for publication.

Graham Land

Before 1950 the only Falkland Islands Dependencies Survey stations fro which there was direct access to the Graham Land mainland were those a Hope Bay (north-east Trinity Peninsula) and Stonington Island (Marguerit Bay). In order to extend the boundaries of the geological surveys it wa therefore frequently necessary to undertake major sledge journeys along th coastal sea ice, on the plateau and across the east coast ice shelf from thes stations. However, since that time further stations have been established a a number of well-sited localities along the north-west coast and on off-sho islands. From these stations it has been possible to attack the geology of th coastal hinterland and to gain experience of suitable routes across the platea to the east coast.

In early 1944 Operation "Tabarin" established one of the first stations at Port Lockroy (Base A). The rock collections from this area are far from complete and so far no detailed geological mapping has been undertaken. A number of specimens collected by J. W. S. Marr, I. M. Lamb, A. Taylor and W. R. Flett in 1944–45, and by K. Pawson in 1948, indicate that much of this mountainous island area is composed of Upper Jurassic andesitic lavas, agglomerates and tuffs, which are intruded by Andean quartz-diorites. The accurate mapping of Anvers Island in 1955–56 has revealed much of the geological history of this area.

Hope Bay has undoubtedly become the most famous of all the geological localities investigated in Graham Land, because of the remarkable assemblage of Middle Jurassic plants (mostly preserved in iron pyrites) discovered by the Swedish South Polar Expedition, 1901–03, in the lacustrine sediments of Mount Flora. Hope Bay is the northern gateway to the geologically important James Ross Island area and the east coast of Graham Land.

In 1945, a station (Base D) was established at Hope Bay. During the year exploration was directed towards the coasts of Crown Prince Gustav Channel and the James Ross Island group, from which large quantities of rock and fossil specimens were collected. A special collection of Middle Jurassic plants was also made from Mount Flora. It was unfortunate that, because of an accident the geologist, W. R. Flett, was confined to the vicinity of the station for the greater part of the year.

In the following year W. N. Croft made a thorough investigation of north-east Trinity Peninsula, where he mapped the Trinity Peninsula Series grey-wacke facies sediments and also discovered at Church Point an identical Jurassic stratigraphic succession to that already known from Mount Flora. Although he did not realize it at the time, he made a great contribution to the study of the thermal metamorphism of the Trinity Peninsula Series by the early Tertiary Andean granite-gabbro intrusive suite. He also visited many of the islands of the James Ross Island group, mapping and collecting numerous fossils from the Cretaceous and Tertiary sediments of Snow Hill, Seymour and Cockburn Islands. He re-investigated the occurrence of gigantic fossil penguins in the Oligo-Miocene sediments of Seymour Island and re-covered quantities of well-preserved bones which were later described by B. J. Marples.[25] From the Campanian beds of the Cape Lachman area he collected several specimens of decapods which were hitherto only known from a single weathered concretion picked up on the beach at Snow Hill Island.

The Upper Cretaceous (Lower and Middle Campanian) beds of the James Ross Island group, which were found to be a succession of interbedded coarse sandstones, shales, glauconitic sandstones and calcareous sediments with concretions, yielded an abundant molluscan fauna, including many new ammonites,[26] and even foraminifera. Plant remains, which in places gave rise to thin coal seams, also provided valuable information on climatic conditions. The Oligo-Miocene mudstones and sandy shales of Seymour Island and Cockburn Island were found to contain brachiopods, lamellibranchs and plants. The latter are now being described by O. Selling.

Croft's work in north-east Graham Land during 1946 contributed largely t our present knowledge of this area, but his untimely death unfortunate prevented this brilliant piece of geological work from being completed. How ever, his well-documented field notes and preliminary reports are now bein prepared for publication, and his fossils are being identified and correlate with later collections from the same areas.

At the beginning of 1947 *Trepassey* attempted to enter the Weddell Se with a view to placing a depot at Christensen Nunatak (the easternmost of th Seal Nunataks) and thus provide for future exploration of the east coast. Th ship encountered heavy pack ice and was compelled to return northward In a way this was fortunate because it enabled Croft and R. J. Adie to invest gate the geology of Paulet, Dundee and Joinville Islands. The presence o folded greywacke facies sediments at the landing place on Joinville Islan clearly indicated an eastward continuation of the Trinity Peninsula Series o Hope Bay.

The geology of north-east Graham Land was continued in 1947 by Adie,[1] who investigated the petrology and the sequence of the lavas, tuffs an agglomerates of the Upper Jurassic Volcanics and the mid-Miocene Jam Ross Island Volcanics. He also studied in detail the dynamic metamorphism and the superposed thermal metamorphism (due to Andean intrusives) of th Trinity Peninsula Series.[28, 29] It was possible for him to travel southward along the Larsen Ice Shelf and thus gain a broader view of the lateral distribu tion of the rock sequences already recorded in north-east Trinity Peninsula At Cape Longing he found Cretaceous sediments, containing fish-scales an fragmental molluscan remains, overlying plant-bearing coarse sandstones an grits of possible Jurassic age. Most of the Seal Nunataks were visited and wer found to be composed essentially of highly vesicular olivine-basalts similar t those already studied in the James Ross Island group. The main journey in th latter part of the year traversed the east coast of Graham Land as far south a Three Slice Nunatak. Since most of this coastline had never been previously explored, many interesting discoveries were made. In many places Adie found the lateral equivalents of the Upper Jurassic volcanic sequence, which extended as far south as Churchill Peninsula and Jason Peninsula. He estimated tha the total thickness of these volcanics was at least 8000 ft. At Cape Disappoint ment, which had defied Nordenskjöld's attempted visit in 1902, variegated green, pink and bright red, "pyjama-striped" rhyolitic tuffs, showing re markable micro-structures, were found to contain beds of carbonized woods.[3 These clearly indicated that former forests had been inundated by sudden outbursts of hot volcanic ash. The precise relationship between the rhyolitic volcanics and the "quartz-porphyries" described by Andersson was also solved. These rocks were found to be rhyodacitic crystal tuffs which form a prominent part of the volcanic succession. In view of what is now known o the volcanic activity on the west coast at that time, it is striking that andesites were recorded in so few localities. The Trinity Peninsula Series, in varying degrees of metamorphism, was found to have a remarkably wide southerly distribution. In many places it was intruded by the Andean granite-gabbro

suite, which occasionally formed small ring complexes displaying the precise order of intrusion.

M. C. Green replaced Adie at Hope Bay in 1948. He worked steadily on a detailed investigation of the exact stratigraphy of the James Ross Island Upper Cretaceous sediments, and, although it is clear that he had achieved interesting results, his entire efforts were completely destroyed when the station was burned down and Green tragically lost his life.

With the re-establishment of the station in 1952 geology of a more detailed nature was started in the Hope Bay and north-east Trinity Peninsula areas. R. Stoneley re-mapped most of the west coast of James Ross Island and the Cape Longing–Cape Sobral–Seal Nunataks area, in addition to making valuable contributions to the geology of the immediate vicinity of the station at Hope Bay. He established the stratigraphic succession related to palaeontological evidence at many places in the Upper Cretaceous sediments and also confirmed post-Cretaceous faulting and folding, especially north of Cape Longing and on James Ross Island. His ammonite collections[31] have yielded much interesting material which has been correlated with previous specimens.

In 1953 A. J. Standring continued the previous geological survey southwards, paying particular attention to the Nordenskjöld Coast, the King Oscar II Coast and the James Ross Island area. During the first sledge journey the Seal Nunataks and Jason Peninsula were visited. He found that the latter area, which was in fact connected to the mainland by a low, ice-covered col, comprised mainly acid volcanics, probably contemporaneous with those of the Hope Bay area, and basalts of a similar type to those of the Seal Nunataks. Seymour Island, from which fossil penguin remains had already been recovered, was re-mapped and Standring clearly established the *unconformable* relationship between the Oligo-Miocene and Campanian sediments. The former beds also yielded vertebrae similar to those found by Nordenskjöld and which are believed to belong to an Archeocete (fossil whale). At the same time he examined parts of James Ross Island and confirmed most of the conclusions reached by Stoneley. His invertebrate fossil collections are now being described.

Later in the year Standring mapped south of the Cape Longing area, where he recorded "quartz-porphyries" intruded by basaltic dykes. At Cape Longing itself he investigated the detailed stratigraphy, concluding that the lower plant-bearing beds belonged to the Jurassic and that they were *unconformably* overlain by the Cretaceous succession, from which he recovered several well-preserved ammonites.[31] He also confirmed the presence of a major fault between Cape Longing and the mainland which had been previously reported by Adie.

In the summer of 1953–54 a small party was landed on Joinville Island and Standring was able to map the island completely. He discovered that the western part of the island, consisting mainly of Trinity Peninsula Series greywackes and shales folded in an anticlinorium and overlain by presumably Jurassic rhyolites, was faulted against Mesozoic sediments forming the eastern part. Small Andean intrusions pierce both the Trinity Peninsula Series and

Mesozoic sediments at several places along the south coast. An importan discovery during this year was that of Mesozoic rocks at Pedersen Nunatak i the Seal Nunataks.

During 1954 R. C. Mottishead and R. J. F. Taylor visited The Naze wher they discovered some fossil vertebral remains which have been tentativel identified as belonging to a Cretaceous Plesiosaur-like reptile, the first to b recorded from Antarctica.

With the siting of a station at Stonington Island (Base E) in 1946 surve work was begun in south-western Graham Land. J. R. F. Joyce[32] collecte rocks from the immediate vicinity of the station and Neny Fjord, but h sledging on the plateau was relatively unproductive because of the sparsity o outcrops.

No geologist accompanied the Falkland Islands Dependencies Survey Ronne Antarctic Research Expedition journey down the east coast of Graham Land south to Cape Adams in 1947–48, but the few specimens collected b D. P. Mason have been most valuable. They included many examples of th Trinity Peninsula Series sediments in various stages of dynamic and therma metamorphism thus demonstrating conclusively the far wider extent of th Trinity Peninsula Series[29] than previously assumed.

V. E. Fuchs worked in conjunction with Adie on Stonington Island in 194 and 1949. They re-examined the immediate vicinity of Neny Fjord and Ma guerite Bay, working out the distribution, stratigraphy and petrology of th Archean Basement Complex,[33] which comprises a series of amphibolite *ortho-* and *para*-gneisses, hornblende- and mica-schists that have been deforme by at least two phases of regional metamorphism. In several localities th Basement Complex is intruded by coarse-grained granites,[33] which have bee tentatively assigned to an Early Palaeozoic age. Xenoliths of these granit and the Basement Complex metamorphics have been found in association the Upper Jurassic andesitic agglomerates of the same area. The highly altere and contorted volcanic tuffs[33] of north-east Alexander Land have been tent tively correlated with the earliest volcanics of Pourquoi Pas Island and a also believed to belong to the early Palaeozoic. Because of the great distanc separating the outcrops of these rocks the exact relationship between th volcanics and the older granites has not yet been established. The journeys northern and southern Marguerite Bay revealed the wide distribution andesitic agglomerates, lavas and tuffs, which in several places are intrud by granitic, dioritic and gabbroic complexes of Andean affinity. In Margueri Bay the general intrusive order in the Andean granite-gabbro suite[28] w found to be closely similar to that already recorded by Adie on the Graha Land east coast.

In the summers of 1948–49 and 1949–50 Fuchs and Adie journeyed Alexander Land where they investigated the sediments recorded by Flemin They collected belemnites from the coarsely bedded aqueous volcanic tuffs Belemnite Point and ammonites,[31] gastropods, annelids and lamellibranch from the tuffaceous sediments of Ablation Point and Fossil Bluff. Most of t east coast was visited and it was established that in the more southerly par

an 800 ft. conglomerate[35] was present. Although it was previously considered that there was a *conformable* transition from the Upper Jurassic into the Lower Cretaceous it is now certain that this conglomerate at the base of the Cretaceous indicates an unconformity or disconformity. This is confirmed by the presence of an abundant molluscan fauna of Aptian age[31, 34] in the sediments above the conglomerate. Most of the Alexander Land sediments contain a certain amount of unidentifiable plant material which seems to have a Mesozoic affinity.

They concluded that severe overthrusting from the west, folding, and transverse faulting were responsible for the complex structure in the sediments. Because of this, the structural and tectonic pattern of Alexander Land and the precise history of this area have not yet been completely worked out. It seems clear that while volcanism was proceeding with some vigour on the north-west coast and in Marguerite Bay, Alexander Land was the scene of active sedimentation in Upper Jurassic times. A considerable amount of air- and water-borne volcanic debris reached this area and great thicknesses of fossiliferous sediments accumulated.

Fuchs and Adie also visited the Eklund Islands which were found to be a small Andean intrusive complex.

Although the Argentine Islands (Base F) have been occupied continuously since 1947, no detailed geological survey of this interesting group has so far been attempted. The reason for this is that much is known of the geology from the adequate collections made by the British Graham Land Expedition in 1935. Upper Jurassic andesitic agglomerates, lavas and tuffs intruded by Andean diorites form the greater part of this group.

When a station was established at Prospect Point (Base J) in 1957 a geological survey of the Graham Coast was begun by R. Curtis. Although reconnaissance observations are still in progress it can be reported that most of the offshore islands and coastal rock exposures so far examined comprise mainly pyroclastic rocks (probably contemporaneous with the Upper Jurassic volcanics of other parts of this coast), which are intruded and thermally metamorphosed by Andean diorites and gabbros in places. Detailed surveys have already been made of some offshore islands.

Because of the obvious presence of copper staining on the high rocks of Copper Peak on the north side of the Neumayer Channel, Anvers Island has attracted the attention of geologists for many years. In 1955 a station (Base N) was built at Arthur Harbour and a detailed survey of the island was begun by P. R. Hooper. In 1955 and 1956 he examined the whole of Anvers Island except the north-eastern part and the many off-lying island groups to the south-west and in Bismarck Strait. He made full use of the inadequate boat at the station and visited parts of Doumer Island and Wiencke Island. He reported that Anvers Island was composed essentially of an older sequence of volcanic lavas, tuffs and breccias, which in places is thermally metamorphosed by later Andean intrusions. A second group of rocks closely resembling medium-grained intrusives, but abnormally rich in quartz, occurs in a number of places. He believed that at least some of these rocks represent *altered* volcanic breccias of the type already mentioned. The Andean suite,

represented predominantly by quartz-diorites, forms intrusions at many localities. A coarse granite, which is uniform over large areas and which is probably younger than the Andean intrusives, is present on the south-west coast. At the north-east corner of Anvers Island a series of lavas filling the valleys in the Andean quartz-diorite intrusives has been observed but their age is not yet clear. No sedimentary rocks have so far been recorded on Anvers Island. The geology of Anvers Island is now being worked up in the laboratory and the preliminary results should be available fairly shortly.

A station (Base O) was established at the northern end of Danco Island (Danco Coast) in 1956. Sea ice conditions during the winter months precluded active sledging to the mainland but much reconnaissance survey was carried out by boat between Cape Anna and Andvord Bay. The coasts and islands of north Wilhelmina Bay and Charlotte Bay were examined by M. B. Bayly. Accessibility to most of this area was not easy and most journeys had to be carried out by manhauling. Detailed local investigations revealed that the greater part of this area comprises a succession of acid and basic volcanics intruded by Andean diorites and gabbros. The acid volcanics are particularly interesting, because the majority of them are tuffaceous and are locally rhythmically banded, resembling some of the rhyolitic tuffs on the Graham Land east coast. Some of these tuffs carry large quartz phenocrysts and resemble the quartz-plagioclase-porphyries described from other localities. Numerous dykes, ranging widely in composition and some of which are distinctly alkaline, intrude the volcanics.

In 1957, J. G. Hobbs worked southward into Paradise Harbour and Andvord Bay, where he reported metamorphosed unfossiliferous sediments from Neko Harbour. In Paradise Harbour an interesting contact between the sediments and the volcanics was discovered, but the precise stratigraphic relationship is still obscure. The geology of Lemaire Island and Bryde Island was also examined and volcanics intruded by gabbros and quartz-diorites were found.

H. G. Wright began a preliminary survey of the Loubet Coast in 1956 when the station (Base W) was built on Detaille Island. From there he covered much of Lallemand Fjord and Hanusse Bay but he found that most of the rock outcrops were often inaccessible because of a continuous coastal ice cliff. Basement Complex gneisses were reported from several localities and it seems that the early Palaeozoic granites are absent. In Lallemand Fjord sediments similar to those of the Trinity Peninsula Series were recorded but pyroclastics and extrusive andesites predominate over the greater part of the area. The Andean suite with most of its differentiates intrudes all of these rocks. In 1957 this work was continued by D. C. Goldring, who has reported the widespread occurrence of altered volcanics intruded by Andean diorites. In many respects the geology of this area is similar to that of Anvers Island.

A station (Base Y) was established on the north side of Horseshoe Island in 1955. During the two following years J. A. Exley mapped this island in great detail. Whenever possible he extended his activities northward into Bourgeois, Bigourdan and Dogs Leg Fjords and eastward into Square Bay. During both winters sea ice conditions were unfavourable. It was impossible to carry out

any lengthy sledging programme and therefore the area surveyed geologically was necessarily limited. At Horseshoe Island Exley found that the Basement Complex, early Palaeozoic granites, Jurassic volcanics and a complete range of Andean intrusives make up the island. His most interesting discoveries included a spotted diorite, possibly older than the Andean intrusives, and a series of sediments below the andesitic volcanics. These sediments may in fact be contemporaneous with those recorded from Lagotellerie Island and the Faure Islets.

A refuge was later established at Blaiklock Island in 1955, whence it was possible to cover much of Bigourdan Fjord.

In 1957 N. A. A. Procter continued the survey in the vicinity of Blaiklock Island, where he recorded numerous outcrops of volcanic agglomerates and tuffs intruded by Andean rocks. A certain amount of detailed survey has been completed in Laubeuf Fjord, and investigations have begun on the east coast of Adelaide Island.

South Orkney Islands

Laurie Island was one of the first parts of the Antarctic to be investigated geologically, and it was early recognized that the South Orkney Islands formed an integral part of the Scotia Arc which links the South American Andes with the Antarctandean mountain chain of Graham Land.

The station (Base C) at Cape Geddes, Laurie Island, was occupied in 1946, and before it was closed in March 1947 the immediate vicinity was mapped by Adie. The contorted and sheared greywackes, grits and black shales from Cape Geddes were similar to those forming the remainder of Laurie Island. At the same time he visited Sandefjord Bay, Coronation Island, and Signy Island where regionally metamorphosed sediments (schists and gneisses) including crystalline limestones occurred.

In March 1947 a station (Base H) was established at Börgen Bay, Signy Island, and it was possible for a survey of Signy Island and the south coast of Coronation Island to be made. A few representative rock specimens were collected from Signy Island.

It was not until the following year, when D. H. Maling undertook responsibility for the geology in addition to many other scientific activities, that the geological mapping of Signy Island began. Although he lacked geological experience at that time, he produced a useful plane-table geological map of the island. He also collected from the rock outcrops on the southern coast of Coronation Island east of Gerd Islet, in spite of being hampered by particularly difficult field conditions and poor equipment. Maling found there was a close similarity between the rocks of the two islands, but quartz-biotite-schists predominated on Coronation island. In several localities dolerite dykes, similar to those previously described by Tilley, intruded the schists. At the east end of Coronation Island he discovered an unconformity separating the Basement Complex metamorphics from the overlying quartz-pebble conglomerates reported by Harvey Pirie in Spence Harbour. Unfortunately he was unable to reach Powell Island and Fredriksen Island. In 1953 a number of useful specimens were collected from these islands by A. G. Tritton.

In 1956 D. H. Matthews began a detailed survey of Coronation Island. Starting at Cape Meier he worked eastwards examining most of the rock outcrops on the south coast and on both flanks of the inland plateau. Later he extended his mapping and structural observations to the accessible parts of the north coast. Most of his work was carried out under difficult climatic conditions and manhauling was necessary on all his journeys. Matthews concluded that intense large- and small-scale folding, faulting and overthrusting were responsible for the extremely complex structure of both these islands. He confirmed that the metamorphics of Coronation Island were mainly schists intruded by occasional dolerite dykes, but his main contribution was toward the solution of the structure. The east coast of the island, where the conglomerates occur, was mapped carefully and it was found that the conglomerates rest on brecciated Basement Complex at three localities, but at a fourth a thin shale bed separates the conglomerate from normal schists. This conglomerate, which in places contains large slabs of schist, is characterized by beautifully rounded vein-quartz pebbles. Poor belemnites and fragmented mollusca are known to occur in some of the conglomerate boulders. Poor plant material, tiny lamellibranchs, gastropods and brachiopod fragments were recovered from the shale bed. On Powell Island Matthews recorded another conglomerate containing sandstone boulders and poor plant remains. The respective ages of the two conglomerates and the fossiliferous shale bed have not yet been determined, but the fauna from the boulders in the quartz-pebble conglomerate is consistent with a Cretaceous age.

In late 1956 parts of Signy Island not previously covered by Maling were re-mapped.

The geology of the South Orkney Islands has now reached an advanced stage and the laboratory work has almost been completed. It is hoped that shortly a complete set of reports covering the Falkland Islands Dependencies Survey investigations in this group will be published.

Conclusion

Geological work in the Dependencies is proceeding throughout the year. In the summer months boats are used to transport field parties to the smaller offshore island groups, and most of the winter work is being done during sledge journeys. With advancing knowledge of Antarctic climate it has at last become possible for the geologists to adapt themselves rapidly to changing field conditions throughout the year and thus to overcome difficulties, such as the unstable sea ice, which have considerably hampered field work on the west coast of Graham Land during the past few years.

Only the more accessible parts of the Dependencies have yet been geologically surveyed in any detail, and, as the field work advances, it is becoming increasingly more difficult to reach the unsurveyed parts. Before an accurate assessment of the Dependencies can be made, all the more remote regions must be probed thoroughly. It is therefore clear that future geological parties will depend largely on the use of aircraft as a means of transport. The use of helicopters for short journeys and of heavier aircraft for trans-

porting field parties with complex geophysical equipment is no longer experimental.

The air photographic cover provided by the Falkland Islands and Dependencies Aerial Survey Expedition during the summers of 1955–56 and 1956–57 has greatly assisted the geologists and has certainly speeded the field work. Similarly, without the constant close co-operation of the Directorate of Overseas Surveys in providing topographical maps, field geological studies in the Dependencies would have been severely limited.

The geological work of the Falkland Islands Dependencies Survey is not only carried on in the Antarctic. Equally important is the laboratory work. With this particular aspect in view the Colonial Office has negotiated a contract with the University of Birmingham, where all laboratory aspects of the geology of the Dependencies are now centred. The results of geological investigations in the Dependencies are periodically published by the Stationery Office in the *Falkland Islands Dependencies Survey Scientific Reports*.

References

[1] J. M. Wordie. The Falkland Islands Dependencies Survey, 1943–46. *Polar Record*, Vol. 4, No. 32, 1946 (1947), p. 372–84.

[2] E. W. Bingham. The Falkland Islands Dependencies Survey, 1946–47. *Polar Record*, Vol. 5, Nos. 33, 34, 1947, p. 27–39.

[3] D. P. Mason. The Falkland Islands Dependencies Survey: Explorations of 1947–48, *Geographical Journal*, Vol. 115, Nos. 4–6, 1950, p. 145–60.

[4] V. E. Fuchs. The Falkland Islands Dependencies Survey, 1947–50. *Polar Record*, Vol. 6, No. 41, 1951, p. 7–27.

[5] V. E. Fuchs. Exploration in British Antarctica. *Geographical Journal*, Vol. 117, Pt. 4, 1951, p. 399–421.

[6] V. E. Fuchs. The Falkland Islands Dependencies Survey, 1948–50. *Journal of the Royal Society of Arts*, Vol. 100, No. 4866, 1952, p. 193–211.

[7] The Falkland Islands Dependencies Survey, 1950–53. *Polar Record*, Vol. 7, No. 48, 1954, p. 166–73.

[8] The Falkland Islands Dependencies Survey, 1953–54. *Polar Record*, Vol. 8, No. 52, 1956, p. 29–32.

[9] The Falkland Islands Dependencies Survey, 1954–55. *Polar Record*, Vol. 8, No. 54, 1956, p. 260–64.

[10] The Falkland Islands Dependencies Survey, 1955–56. *Polar Record*, Vol. 8, No. 57, 1957, p. 526–31.

[11] R. L. Nichols. Elevated beaches of Marguerite Bay, Antarctica. *Bulletin of the Geological Society of America*, Vol. 58, No. 12, Pt. 2, 1947, p. 1213.

[12] R. L. Nichols. Geology of Stonington Island area, Marguerite Bay, Antarctica. *Bulletin of the Geological Society of America*, Vol. 58, No. 12, Pt. 2, 1947, p. 1213.

[13] R. L. Nichols. Preliminary report on the geology of the Marguerite Bay area, Antarctica. *Office of Naval Research, Department of the Navy, Washington, D.C., Ronne Antarctic Research Expedition*, Technical Report No. 6, 1948, 5 p.

[14] R. L. Nichols. Geomorphology of Marguerite Bay, Palmer Peninsula, Antarctica. *Office of Naval Research, Department of the Navy, Washington, D.C., Ronne Antarctic Research Expedition*, Technical Report No. 12, 1953, 151 p.

[15] R. L. Nichols. Bedrock geology of Marguerite Bay area, Palmer Peninsula, Antarctica. *Office of Naval Research, Department of the Navy, Washington, D.C., Ronne Antarctic Research Expedition*, Technical Report No. 13, 1955, 60 p.

[16] P. Sgrosso. La Antártida Argentina. *Revista del Museo de La Plata (Nueva Serie)*, Tomo 4, Sección Geología, No. 23, 1948, p. 179–201.

[17] J. M. Sobral. Epítome geólogico de la Antártida Occidental. *Argentina Austral*, Año. 20, No. 208, 1948, p. 24–33.

[18] A. E. Riggi. La Antártida Argentina: su geografía y su geología. *Instituto Nacional de Investigación de la Ciencias Naturales anexo al Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Extensión Cultural y Didáctica*, No. 4, 1950, 32 p.

[19] J. Olsacher. La geología de Isla Decepción. *Informe para el Instituto Antárti Argentino*, 1954.

[20] J. Olsacher. Observaciones geológicas en caleta Armonía (Isla Nelson). *Informe pa el Instituto Antártico Argentino*, 1955.

[21] J. Olsacher. Informe geológico preliminar sobre las relaciones entre el "Arco de l Antillas del Sur" y los Océanos Atlántico y Pacífico. *Sociedad Argentina de Estudi Geograficos (GAEA)*, No. 1, 1956, 11 p. (Reprinted from: *De la Revista de la Facultad Ciencias Exactas, Fisicas y Naturales*, Año 17, Nos. 3–4, 1955.)

[22] J. Olsacher. Breves observaciones geológicas en Puerto Paraíso, Península Antártic *Universidad Nacional de Cordoba, Museo de Mineralogía y Geología*, Comunicaciones No. 2 1956, 8 p. (Contribución No. 9 del Instituto Antártico Argentino.) (Reprinted from: *De Revista de la Facultad de Ciencias Exactas, Fisicas y Naturales*, Año 18, Nos. 1–2, 1956.)

[23] A. F. Trendall. The geology of South Georgia. I. *Falkland Islands Dependenci Survey Scientific Reports*, No. 7, 1953, 26 p.

[24] A. F. Trendall. The geology of South Georgia. II. *Falkland Islands Dependenci Survey Scientific Reports*, No. 19, 1957 (in the press).

[25] B. J. Marples. Fossil penguins from the mid-Tertiary of Seymour Island. *Falklan Islands Dependencies Survey Scientific Reports*, No. 5, 1953, 15 p.

[26] L. F. Spath. The Upper Cretaceous Cephalopod fauna of Graham Land. *Falklan Islands Dependencies Survey Scientific Reports*, No. 3, 1953, 60 p.

[27] R. J. Adie. *The rocks of Graham Land.* Ph.D. thesis, University of Cambridge, 195 (unpublished).

[28] R. J. Adie. The petrology of Graham Land: II. The Andean Granite-Gabbro Intrusiv Suite. *Falkland Islands Dependencies Survey Scientific Reports*, No. 12, 1955, 39 p.

[29] R. J. Adie. The petrology of Graham Land: III. Metamorphic rocks of the Trinit Peninsula Series. *Falkland Islands Dependencies Survey Scientific Reports*, No. 20 (in th press).

[30] R. J. Adie. Geological research in Graham Land. *The Advancement of Science*, No. 5 1957, p. 454–60.

[31] M. K. Howarth. Upper Jurassic and Cretaceous Ammonite faunas of Alexander Lan and Graham Land. *Falkland Islands Dependencies Survey Scientific Reports*, No. 21 (in th press).

[32] J. R. F. Joyce. *The geology of Graham Land.* Ph.D. thesis, University of London, 195 (unpublished).

[33] R. J. Adie. The petrology of Graham Land: I. The Basement Complex; Early Palaeo zoic plutonic and volcanic rocks. *Falkland Islands Dependencies Survey Scientific Reports* No. 11, 1954, 22 p.

[34] L. R. Cox. Lower Cretaceous Gastropoda, Lamellibranchia and Annelida from Alexander I Land (Falkland Islands Dependencies). *Falkland Islands Dependencies Survey Scientific Reports*, No. 4, 1953, 14 p.

[35] R. J. Adie. Representatives of the Gondwana System in Antarctica. *Symposium su les séries de Gondwana, publié par le XIX^e Congrès Géologique International, Algiers*, 1952 p. 393–9.

Appendix

List of Falkland Islands Dependencies Survey Geologists

Base A (Port Lockroy)

None

Base B (Deception Island)

1944 W. R. Flett

Base C (Cape Geddes, Laurie Island)

None

Base D (Hope Bay)

1945	W. R. Flett	1952	R. Stoneley
1946	W. N. Croft	1953	A. J. Standring
1947	R. J. Adie	1954	A. J. Standring
1948	M. C. Green		

Base E (*Stonington Island, Marguerite Bay*)

1946 J. R. F. Joyce
1948 V. E. Fuchs, R. J. Adie
1949 V. E. Fuchs, R. J. Adie

Base F (*Argentine Islands*)

None

Base G (*Admiralty Bay, King George Island*)

1948 E. Platt
1949 D. Jardine, G. Hattersley-Smith

Base H (*Signy Island*)

1948 D. H. Maling
1949 D. H. Maling
1956 D. H. Matthews

Base J (*Prospect Point, Graham Coast*)

1957 R. Curtis

Base N (*Anvers Island*)

1955 P. R. Hooper
1956 P. R. Hooper

Base O (*Danco Island, Danco Coast*)

1956 M. B. Bayly
1957 J. G. Hobbs

Base W (*Detaille Island, Loubet Coast*)

1956 H. G. Wright
1957 D. C. Goldring

Base Y (*Horseshoe Island, Marguerite Bay*)

1955 A. J. Exley
1956 A. J. Exley
1957 N. A. A. Procter

South Georgia Survey, 1951–52. A. F. Trendall
South Georgia Survey, 1953–54. A. F. Trendall

ICE BRIDGES

BY MAJOR P. J. CARSON, R.E.

[*MS. received 25 August 1957.*]

CONTENTS

Introduction . . . *page* 18
Construction 18
Maintenance . . . *page* 1

Introduction

The ice bridges described in this article are constructed annually to repla the ferries which operate during the summer on the Yukon, Pelly and Stewa rivers in Yukon Territory. These river crossings are on the Mayo Road co necting Dawson City and Mayo with the Alaska Highway. The traffic on th road consists largely of heavy trucks carrying mining ores from the Unite Keno Hill, and other mines.

Towards the end of October each year ice floes begin to drift down the riv and the ferry boats have to be withdrawn. A few weeks later the river becom completely frozen over.

Construction

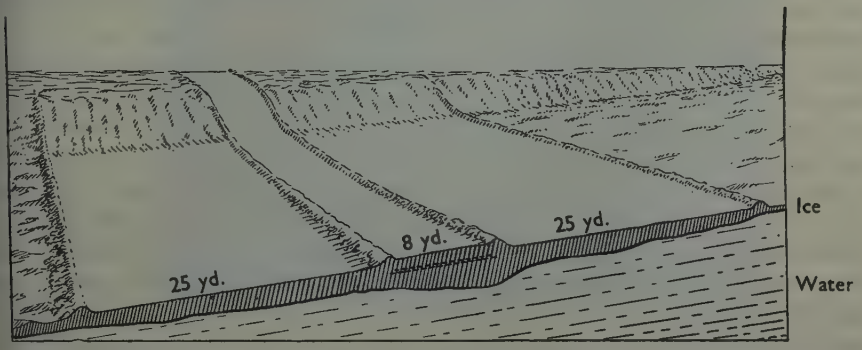
The choice of sites for the ice bridges depends on river currents, ice thickne and suitable approaches; they are not necessarily at the sites of the fer crossings.

A strip of ice across the river, some 60 yd. (65 m.) wide and 25 to 35 i (63 to 89 cm.) thick is cleared of snow and roughly levelled. Snow walls a built along the boundaries of the strip, which is then flooded with pump water to a depth of several inches, in order to level off the surface. A carriag way, 8 yd. (8·7 m.) wide, is constructed down the centre of this strip. First base of wooden planks 1 in. (2·5 cm.) thick is laid lengthwise along the carriag way with ends staggered so as to give a rough bond. The whole area is the flooded, until the planks are covered. A second layer of planks is laid over t first, and then flooding is repeated until the whole area is covered with a lay of ice 12 to 16 in. (31 to 41 cm.) thick. Next, snow walls are built along t edges of the carriage-way itself, and it alone is flooded to a depth of 6 to 8 i (15 to 20 cm.). During all the flooding operations each layer added shou be about $\frac{1}{4}$ to $\frac{1}{2}$ in. (0·6 to 1·2 cm.) thick, and each allowed to freeze hard befo the next is pumped on. As each layer of ice is added, the edges of the str crack, it sinks slightly and the edges re-freeze. Finally the carriage-way stan proud of the surrounding ice by about 6 in. (15 cm.). By increasing t thickness of the ice the life of the bridge is lengthened and the buoyancy increased, allowing heavier loads to be carried.

The bridge is now ready for use, and is capable of carrying 60 vehicles a da each weighing up to 20 tons, for more than 4 months.

Maintenance

During the winter the water level of the river drops considerably and the approaches to the bridge have to be re-ramped from time to time. On the Yukon River this drop was about 7 ft. (2·1 m.) in the winter of 1953–54. The end planks of the carriage-way may become displaced during this process and require re-setting. During the colder months the whole strip must be swept clear of snow which would otherwise insulate it from the hardening effects of the sub-zero temperature. As warmer weather begins, however, the carriage-way must be protected from the sun. This is done by covering it with layers of sawdust, about 2 in. (5 cm.) thick. The surface of the carriage-way will remain firm and hard while the surrounding ice is covered with several inches of slush. Towards the end of April the surfaces of the approaching roads become impassable, and traffic ceases until the ferries re-open.



Section of ice bridge across a frozen river, the base of wooden planks is indicated by the dark line below the carriage way.

The life of these ice bridges during the 1953–54 season was:

Approach roads closed at end of winter	20 April 1953
Ferries began operating	20 May 1953
Ferries withdrawn	20 October 1953
Ice bridges opened	26 December 1953
Approach roads closed at end of winter	6 May 1954

SLEDGE-BOATS

BY J. A. EXLEY[1]

[*MS. received 9 October 1957.*]

Unstable sea ice conditions in 1955 and 1956 made it advisable to carry so form of boat during sledge journeys from the Falkland Islands Dependenc Survey (F.I.D.S.) station at Horseshoe Island, in Marguerite Bay, Grah Land. The account given of a sledge-boat in *Hints to travellers* (Vol. 2, 11th 1938, p. 137) was followed, and a craft similar to that employed by the Oxf University Arctic Expedition of 1935–36 was constructed.[2] When this b was tested it was found to be unstable. This was due both to the saucer-sha cross-section and to the fact that the whole load has to be placed on top of sledge. These disadvantages were overcome by the incorporation into design of a pair of skis, extended from the sledge outer longitudinal and run on plywood struts. These widened the bottom of the boat and increased stability. The new shape was intrinsically more stable, and it was also possi to place cargo in the bottom of the boat, thus lowering the centre of gravi

The boat was easy to row. It was tested with a load of 600 lb. and appea capable of carrying considerably more. Assembly took about 45 minutes, if the canvas sleeves advocated below had been fitted, the time could h been substantially reduced. The weight of the additional sledge-boat co ponents was 36 lb.

Construction. Ration boxes, *A*, *B* and *C* (Fig. 1), are lashed behind handlebars, *A*, on the second bridge, *B*, and over the bumper, *C*, of a 12 Nansen-type sledge. A board, *D*, 4 ft. 6 in. by 4 in. by 1 in., is lashed over ration box *A*, and another board, *E*, 4 ft. 2 in. by 4 in. by 1 in., over the rat box, *B* (Figs. 1, 2). Wooden blocks, *F* (Fig. 2), are screwed above, and 2 from the end of, the boards *D* and *E*. Battens, *G* (Fig. 2), are screwed und neath the boards *D* and *E* in such a position as to engage with the battens the lid of the ration boxes *A* and *B*.

All the lashings are made with one turn of rope with an eye splice at end, which allows them to be tightened and secured quickly by half hitch

Struts, *H* (Figs. 1, 2), made from $\frac{5}{8}$ in. plywood, are shaped to fit clos between the outer longitudinal and the runner of the sledge. They are las to a pair of skis, *J*, about 6 to 10 in. from each end. The skis and struts then lashed and guyed to the sledge, one on each side.

The cover of the boat is made from shaped canvas (Fig. 3). Two spare sle longitudinals form the gunwales, *K* (Figs. 1, 2). The best method of attach these to the canvas cover of the boat would be to have 4 in. deep canvas slee

[1] Falkland Islands Dependencies Survey, Department of Geology, University irmingham.

[2] A. R. Glen. *Under the pole star.* London, 1937, p. 188–90, 210.

Ice bridge over Yukon River, Yukon Territory

Photograph by P. J. Carson

(*See p.* 18)

Sledge-boat

F.I.D.S. photograph by M. Evans

(*Facing p.* 20)

Air view of Mesters Vig showing Gefionelven in foreground; the mining village centre; and entrances to mine above

Photograph by Nordisk Mineselskab A/S

(*See p.* 50)

L, along the edges of the canvas, broken only to allow for rope lashings. As only a limited supply of canvas was available the original boat had to be fitted with a series of cord loops in place of sleeves, but these were difficult to thread, especially in cold weather. At the bow end of the cover there is a pocket in the

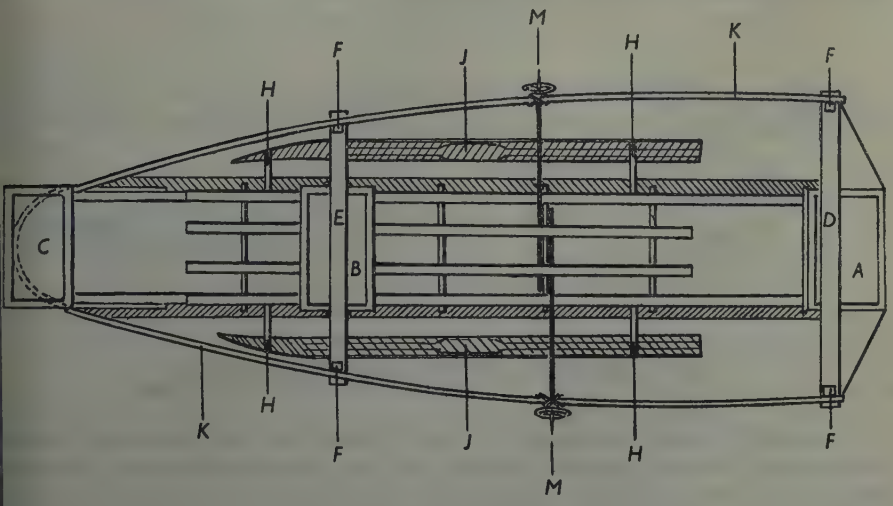


Fig. 1. Plan of sledge-boat.

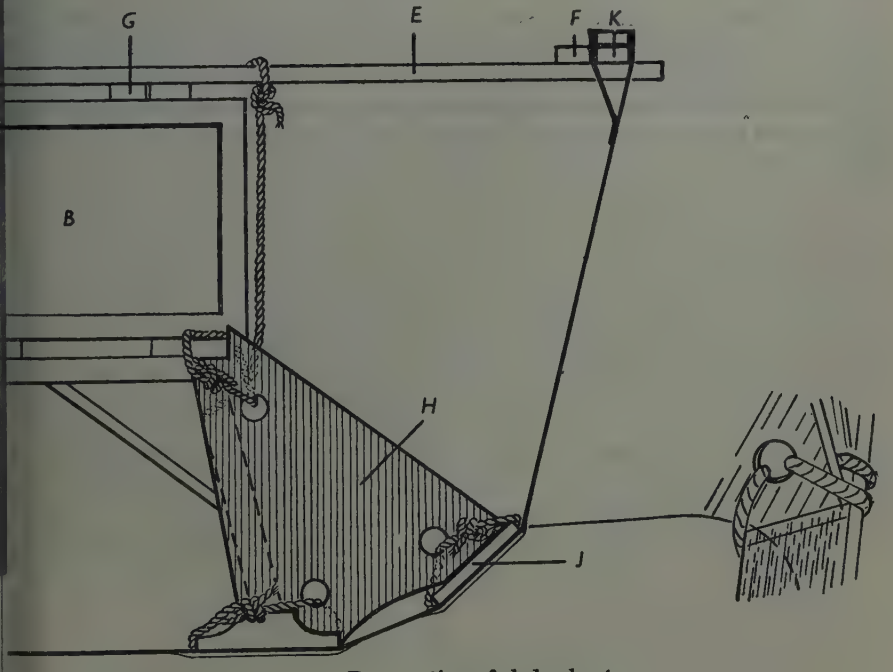


Fig. 2. Part section of sledge-boat.

canvas, to fit over the forward ration box, *C*. At the stern are several len of rope to attach the cover to the sledge handlebars.

The seams of the cover have three rows of machine stitching and the c pleted cover was painted with a hot mixture of two parts of seal oil and part of Stockholm tar, which is distasteful to dogs.

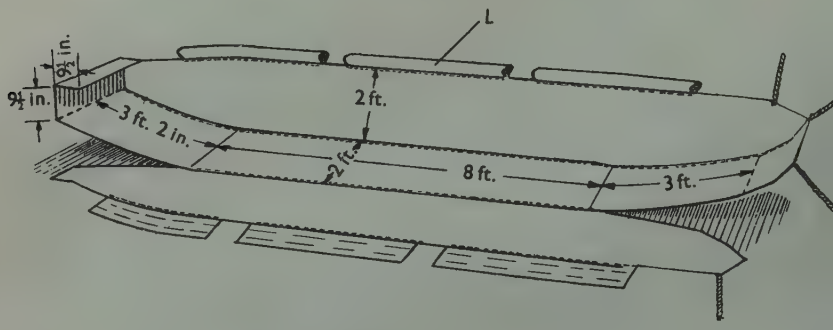


Fig. 3. Pattern for cutting canvas cover of sledge-boat.

Assembly. The cover is first laid out and the gunwales are threaded thro their sleeves. The sledge brake is lashed up to prevent damage to the co The sledge, with the above additions, is placed on the canvas and the slipped in to the pocket of the cover. The gunwales are then lifted over ends of the cross-boards *D* and *E* and secured by lashings; their forward e are lashed against the ration box *C*. The ropes at the stern of the cover tied to the handlebars and the structure is completed by lashing ski sticks, as rowlocks between the fourth bridge and the gunwales on each side (Fig The ends of the ski-sticks are guyed in place, so that another pair of s slipped heel inward through the baskets, can be used as oars (see photogra facing p. 20).

FIELD WORK

ACTIVITIES OF THE ARCTIC ISLANDS SECTION, GEOLOGICAL SURVEY OF CANADA, 1956[1]

[By Dr R. G. Blackadar.]

In 1956 the Geological Survey of Canada carried out investigations in the northern Foxe Basin area, on north-western Ellesmere Island and eastern Axel Heiberg Island.

The first project was conducted by R. G. Blackadar assisted by J. Pirrit, a graduate of Glasgow University. They were flown from Churchill, Manitoba, to Igloolik in Foxe Basin, early in May. At the same time two food and fuel caches were established by air about 150 miles north-east of Igloolik. During the latter part of May, and in June, Blackadar and Pirrit, each travelling separately and with two Eskimos and their dog-teams, examined the area between the western entrance to Fury and Hecla Strait and Jens Munk Island, a distance exceeding 150 miles. Late in June the geologists, accompanied by three natives and teams, proceeded to the mouth of Ravn River at the head of Steensby Inlet. Here the geologists were left with a 17 ft. canoe and 5 weeks food. During the next 7 weeks they traversed that part of Baffin Island north of Steensby Inlet, replenishing their supplies at one of the caches established earlier. On 19 August they reached tide-water again and were met by several natives and their 35 ft. trap boat. After returning to Igloolik, where the party was re-supplied, additional geological investigations were made to the north-west of that post using the native boat for travelling. The party returned south on 18 September.

The second project was conducted by R. Thorsteinsson and E. T. Tozer who proceeded to the Eureka weather station during the Spring Airlift in mid-April. Sledging trips were carried out with the assistance of two natives from Resolute Bay; food caches were established east of the weather station for use during overland foot traverses during the summer, and extended trips were made along Eureka Sound, Nansen Sound, Greely Fiord, Otto Fiord, Borup Fiord, and Hans Fiord. Canyon Fiord was investigated as far as East Cape and the Buchanan Lake region of Axel Heiberg Island was also examined. The sledging season closed early in July and the Eskimos and their teams were flown back to Resolute Bay. The period 4 July to 7 August was devoted to a study of the geology of the Fosheim Peninsula but, following the break-up of Eureka Sound, Thorsteinsson and Tozer left Eureka for the head of Bay Fiord, 150 miles to the south, using a 22 ft. freighter canoe powered by a 9·7 h.p. outboard motor. They returned to Eureka on 3 September; on the 5th several inches of new ice effectively blocked the inlet on which the station is located. The party left Eureka on 29 September by R.C.A.F. aircraft and returned to Ottawa early in October.

The geological results of these investigations will be published at a later date by the Geological Survey of Canada.

[1] Published by permission of the Deputy Minister, Department of Mines and Technical Surveys, Ottawa, Canada.

SWEDISH–FINNISH–SWISS INTERNATIONAL GEOPHYSICA YEAR EXPEDITION TO NORDAUSTLANDET, 1957–58: OPERATIONS IN 1957

[Summarized from *Dagens Nyheter*, 15 June–7 September 1957 and *Stockholms-Tidning* 14, 16 and 28 July 1957. Previous reference was made to this expedition in the *Polar Reco* Vol. 8, No. 56, 1957, p. 446.]

In July 1957 the base of the Swedish–Finnish–Swiss International Geophysical Y expedition to Nordaustlandet, Spitsbergen, was established at Kinnvika, on t north side of Murchisonfjorden. Members of the wintering party are:

Gösta H. Liljequist (Sweden), Leader, meteorologist
Matti Aro (Finland), Medical officer
Carl-Axel Bäckstedt (Sweden), Radio operator, meteorological assistant
P. Wasserfallen (Switzerland), Atmospheric electricity
Erik Dyring (Sweden), Cosmic rays
Hans Engström (Sweden), Electrical engineer
Erkki Gröndahl (Finland), Radio-sonde
Karl-Erik Heikkilä (Sweden), Cosmic rays
Ilmari Helimäki (Finland), Meteorologist, radio-sonde
André Junod (Switzerland), Atmospheric electricity
Sven Eric Molander (Sweden), Instruments
Edgar Tollén (Sweden), Electrician, cook
Karl-Erik Wärme (Sweden), Chemist

The main party, consisting of Liljequist, Aro, Bäckstedt, Engström, Grönda Helimäki, Junod, Molander and Tollén, together with Yrjö Wilska (Finland), engineer in charge of installation work, and three Swedish carpenters, left Stockh on 6 July. In Kiruna they were joined by Heikkilä with some Greenland sledge do From Harstad they sailed in the coal boat *Inger V* to Longyearbyen, which th reached on 13 July, and then transferred to the Finnish marine research ve *Aranda*, which had brought part of the expedition's stores and equipment fr Sweden.

Aranda reached Murchisonfjorden on 15 July and the work of setting up the b immediately started. *Aranda* left Muchisonfjorden again on 25 July. On the 2 the Swedish minelayer *Älvsnabben*, kommendörkapten Bengt Lundvall, arrived w the rest of the expedition's equipment. The remaining member of the winter party, Dyring, was on board.

A number of scientists went north on the ships for the summer only. These w Professor Jean Lugeon, chief of the Station Centrale Suisse de Météorologie, an charge of the expedition's atmospheric electricity programme, and J. H. Brunn Dr Arne Eld Sandström, Uppsala (cosmic rays); K. Borg, Stockholm (terrest magnetism); C. G. Ohlsson, representative of Vetlandahus, the Swedish firm provid the expedition's houses; and a party of glaciologists: Weston Blake jr. (United Stat H. C. Ehrström (Sweden), A. Häggblom (Finland) and Dr E. Palosuo (Finla members of the Swedish Glaciological Expedition to Nordaustlandet.

Stores and building materials were taken ashore by landing craft, one of wh capsized while unloading in a strong wind. Three temporary quays were built on shore. Unloading was finished by the evening of 31 July, and *Älvsnabben* Murchisonfjorden on 1 August. The base consists of a number of insulated, fabricated wooden buildings; living quarters, kitchen, and laboratory are all in main building in the centre.

On 16 August a Catalina of the Swedish airforce, commanded by kapten Brunstorp, brought the Swedish glaciologists Professor Gunnar Hoppe and Va Schytt and a journalist from Stockholm. Air reconnaissances were carried out

the area in case any member of the expedition had later to be evacuated. Air photographs were also taken for glaciological purposes. Great difficulty was met in trying to find sheltered moorings for the Catalina in Murchisonfjorden, and during a period of storms the aircraft was several times in danger of being wrecked.

On 24 August the home agent of the expedition, Walter Bischof, visited Kinnvika in the Norwegian ship *Sjøvern*, and a visit was made by Norsk Polarinstitutt's vessel *Minna* a few days later. When the Catalina left Murchisonfjorden on 28 August there remained only the thirteen men of the wintering party, and Blake, who was to be collected by *Nordsyssel* on 1 October. A telegram received in Stockholm on 6 September reported that aerological investigations had been started on 1 September, and that the auroral camera had been set up.

INTERNATIONAL GLACIOLOGICAL EXPEDITION TO GREENLAND, 1957–60: OPERATIONS IN 1957

[From information supplied by Expéditions Polaires Françaises.]

An international glaciological expedition to Greenland (E.G.I.G.), in connexion with the glaciological programme of the International Geophysical Year, is being sponsored by the International Commission on Snow and Ice. The nations taking part are Denmark, France, Germany and Switzerland. The expedition is to be led by Paul-Emile Victor, and organized by Expéditions Polaires Françaises. The special committee for the expedition consists of Professor R. Haefeli, President, R. Finsterwalder, Vice-President, M. A. Bauer, Secretary, B. Brockamp, Borge Fristrup, F. Kobold, Helge Larsen, J. Martin and P.-E. Victor.

The area to be studied is that in which Expéditions Polaires Françaises worked in 1948 to 1953, and more particularly between lats. 68° and 73° N., and longs. 53° W. and 28° E. The objects of the expedition are the following studies: the ice sheet in the area; the adjacent areas to the east and west; glaciers in Disko Bugt and Umanak Bugt, particularly the glacier Kangerdlugssuak in Umanak Bugt; and the hydrology of a typical fjord, that of Kangerdlugssuak. Activities in 1957 were confined to reconnaissance flights to select a suitable route on to the ice sheet from the west, and photographic survey in Disko Bugt and Umanak Bugt. In 1958 the expedition will transport their material to Søndre Strømfjord and in 1959 it will begin the traverses across Greenland, which are expected to last until 1960, including a wintering party in the centre of the ice sheet.

Between 25 April and 14 May, P.-E. Victor, together with Børge Fristrup and André Roch, carried out the air reconnaissance programme. The aircraft used was an "Alouette" helicopter, piloted by Lieut. A. Cessou, which was transported to Greenland in a "Nord 2501", piloted by Commandant R. Despouy. Both aircraft were provided by the French Secretariat d'Etat aux Forces Armées (Air). The object of the flights was to find a route suitable for weasels from the air base at Søndre Strømfjord up on to the ice sheet. Journeys were made by aircraft, helicopter and on foot, and finally a route was chosen leading up from the coast about 25 km. from the Søndre Strømfjord.

On 4–6 May P.-E. Victor, Lieut. Cessou and Sergt. Baisson made a round flight by helicopter of 960 km., visiting former Expéditions Polaires Françaises bases at Disko Bugt and at 85 km. inland on the ice sheet (camp VI). Installations left by the expedition in 1948–49 were inspected. The party was grounded by a snow storm at Jakobshavn for 40 hours. The helicopter developed no mechanical troubles during this long flight.

The "Nord 2501" aircraft made two flights to drop supplies to the French expedi tion in central Greenland under Jean Dumont, which was established by parachut in August 1956.[1]

On 2 July the two aircraft returned to Søndre Strømfjord from France to carr out the second part of the year's programme. This time the party consisted o P.-E. Victor, Professor Finsterwalder, Dr W. Hofman, Professor Bauer an Børge Fristrup.

A detailed map of the route up on to the ice sheet was made, and photograph taken of the area.

A K22 vertical camera was installed in the "Nord 2501" and the glacier fronts i Disko Bugt and Umanak Bugt were photographed in three sorties from 5000 m Air photographs were also taken of other areas including the drainage basin of th Kangerdlugssuak glacier in Umanak Bugt, and of the zone of large crevasses on th western border of the Greenland ice sheet, between lats. 66° and 72° N.

CANADIAN OPERATION "HAZEN", 1957

[By G. Hattersley-Smith.][2]

Operation "Hazen" has been organized as part of the Canadian Internationa Geophysical Year programme to carry out meteorological, glaciological and geo logical work over two summers and one winter in the Lake Hazen region of norther Ellesmere Island. The glaciological work includes ice-thickness determinations b seismic and gravity methods. Biological and archaeological investigations were no undertaken in 1957, but may form part of the summer programme in 1958.

The following were in the field during the summer of 1957:

G. Hattersley-Smith, Leader, glaciologist
K. C. Arnold, Surveyor
R. L. Christie, Geologist
Professor R. E. Deane, Pleistocene geologist
Sergeant D. Engel, Mechanic
J. D. Filo, Assistant geophysicist
F. S. Grant, Geophysicist
J. R. Lotz, Meteorologist
H. Sandstrom, Assistant geophysicist

Between 28 April and 3 May the party were flown to Lake Hazen by 435 Squadro of Air Transport Command, Royal Canadian Air Force. A total of ten landings wer made on the lake by C. 119 aircraft ("Flying boxcars") in transporting approxi mately 35 tons of stores, fuel and equipment. The first two landings were made on a unprepared ice strip. A bulldozer, carried in at the first landing, was used to clea 11 in. of snow from a 3500 ft. airstrip for subsequent landings.

The base camp, which included two "Attwell" shelters, was established on th north shore of Lake Hazen, 520 ft. above sea level. On 3 May an advance camp wa established on Gilman Glacier, 40 miles north-east of the lake at a height of abou 3500 ft. Three landings by a ski-wheel C.47 aircraft (Dakota) of 408 Squadron R.C.A.F., were necessary to carry out this part of the operation. The party of tw who manned the base camp from April to August were mainly occupied wit geological and limnological work, but also made meteorological observations. Geo logical reconnaissances were made eastward to Lady Franklin Bay, west as far a Very River, and south to Dodge River. The glacier camp was manned by a party o six—glaciologist, meteorologist, seismologist and two assistants, and surveyo

[1] *Polar Record*, Vol. 8, No. 56, 1957, p. 447.
[2] Published by permission of the Chairman, Defence Research Board, Canada.

South Georgia Survey, 1956–57: looking S.S.E. from 1 mile S.E. of Diaz Cove

Photograph by Duncan Cars

Accumulation and ablation studies were made from the snout of the glacier at 1300 ft. to the highest part of the ice cap at 6000 ft. Englacial temperatures were measured and crystal structure studied to a depth of 50 ft. at the glacier camp. Annual accumulation back to about 1930 and temperatures were recorded in a 20 ft. pit at 6000 ft. Movement studies of the glacier were also made. Meteorological and micrometeorological observations were made at 2-hourly intervals between 08.00 and 22.00 from 1 June to 5 August. Seismic profiles were shot at intervals of 1 to 2 miles from within a mile of the glacier snout north-westward up the glacier for a distance of about 15 miles. A level survey was made in connexion with the seismic work from the base camp near John's Island to a height of about 4500 ft. The ice cap of the interior maintains a height of 6000 to 6500 ft. over a wide area. Mount Oxford reaches a height of about 7300 ft., not 9000 ft. as reported by members of the Oxford University Ellesmere Land Expedition in 1935, the only previous visitors.

Travel in the vicinity of the lake was by tractor, dog team and motor-boat. Dog teams were used on the glaciers and ice cap throughout the summer. Dogs were hired from Thule (Kanaq) by courtesy of the Danish authorities.

Field work ceased on 15 August when the icebreaker U.S.C.G.C. *Eastwind*, Captain R. F. Rea, U.S.C.G., arrived at the head of Chandler Fiord to evacuate the summer party and bring in the winter party of four. Fifteen tons of stores and fuel were carried in thirty-five flights by a U.S. Navy Piasecki helicopter, from a distance of 30 miles via Ruggles River. The change-over of the station was completed in 3 days.

The winter party consists of the following graduate geographers from McGill University, who will continue the meteorological programme, and make regular observations on snow accumulation and ice formation on the lake in order to determine its suitability for landing aircraft:

C. R. Harington, Leader	J. M. Powell
C. I. Jackson	D. I. Smith

Extensive field work by a large party is planned in the summer of 1958.

SOUTH GEORGIA SURVEY, 1956–57

[From information supplied by V. D. Carse. Notes on previous seasons work of the South Georgia Survey were published in the *Polar Record*, Vol. 6, No. 46, 1953, p. 807–08 (1951–52); Vol. 7, No. 50, 1955, p. 403–04 (1953–54) and Vol. 8, No. 55, 1957, p. 354–56 (1955–56).]

At the end of the 1955–56 season it was estimated that the following areas, amounting to about 5 per cent of the islands of South Georgia, had not been surveyed:

Willis Islands and Bird Island
Antarctic Bay and eastwards to Cape Best
Coastal detail from Fortuna Bay to Hound Bay
Gold Harbour to Iris Bay
The south coast from Nattriss Head to Rogged Bay
Novosilski Bay to Leon Head
Rocky Bay to Cape Darnley
Annenkov Island
The Cape Nuñez peninsula and Queen Maud Bay
Chapman Bay to Cape Demidov
Kade Point
Coal Harbour to a point about 1½ miles east of Romerof Head

South Georgia Survey, 1957–58; Cooper Bay from N.N.E., October 1956

Photograph by Duncan Carse

V. D. Carse therefore returned for the 1956–57 season to complete as much of the work as possible himself.

The work was done from the sealers *Albatros* and *Diaz* and, by mid-November, the only areas that remained not completely surveyed were:

Antarctic Bay eastwards to the Fortuna Glacier (coastline)
The Calf Head–Cape Harcourt peninsula (contours)
The area of the Weddell and Bertrab Glaciers (contours)
Novosilski Bay to the glacier about 3 miles north (coastline)
The area of the Reusch Glacier (contours)
North end of Rocky Bay to Newark Bay (coastline)
Annenkov Island (the north-west and south-west extremities)
Klutschak Point to islands 3 miles east (coastline)

In addition, the area between the Allardyce Range and the coast, from Fortuna Bay to Hound Bay, was completely re-surveyed and the contours revised.

FALKLAND ISLANDS AND DEPENDENCIES AERIAL SURVEY EXPEDITION, 1955–57: OPERATIONS IN 1956–57

[Summarized from an unpublished report *Falkland Islands and Dependencies Aerial Survey Expedition, Report on second season's operations*, 1956–57, by P. G. Mott. Issued by Hunting Aerosurveys Ltd.]

During the Antarctic summer of 1956–57 the Falkland Islands and Dependencies Aerial Survey Expedition continued the work started the previous season.

The *Oluf Sven*, carrying personnel, stores and a Bell 47-D helicopter, left Harwich on 20 October 1956 and arrived at Deception Island on 26 November. Modifications had been carried out to the ship to provide a hangar for the helicopter in one of the holds, and two hand winches had been installed to raise the machine to deck level. A sectional flight deck was carried and erected over the raked deck of the ship, but in practice it was found that the helicopter could operate with ease from the lift platform itself.

On the arrival of *Oluf Sven* at Deception Island the buildings and installations left at the close of the previous season were opened up and made ready for service again; by 1 December everything was prepared for the arrival of the survey aircraft.

The two "Cansos" which had been used during the first season were again flown from Canada, leaving Toronto on 24 September and reaching Port Stanley on 15 October. During a stay of 5 weeks in the Falkland Islands they completed the vertical photography of the whole area of the islands at a scale of 1:25,000. The ground photography staff, travelling in *Oluf Sven*, were not at hand to process each day's results so that tracking of the aircraft had to be carried out using Admiralty Charts, and flying from coast to coast on recognizable landmarks. The higher ground in the interior, largely unmapped and rising to 2000 ft., resulted in gaps due to height distortion that had to be filled in by later sorties. The velocity and variability of winds were another constant difficulty. Nevertheless, 5268 effective exposures were taken, covering 4500 sq.miles. Each aircraft flew about 50 hours during the operation.

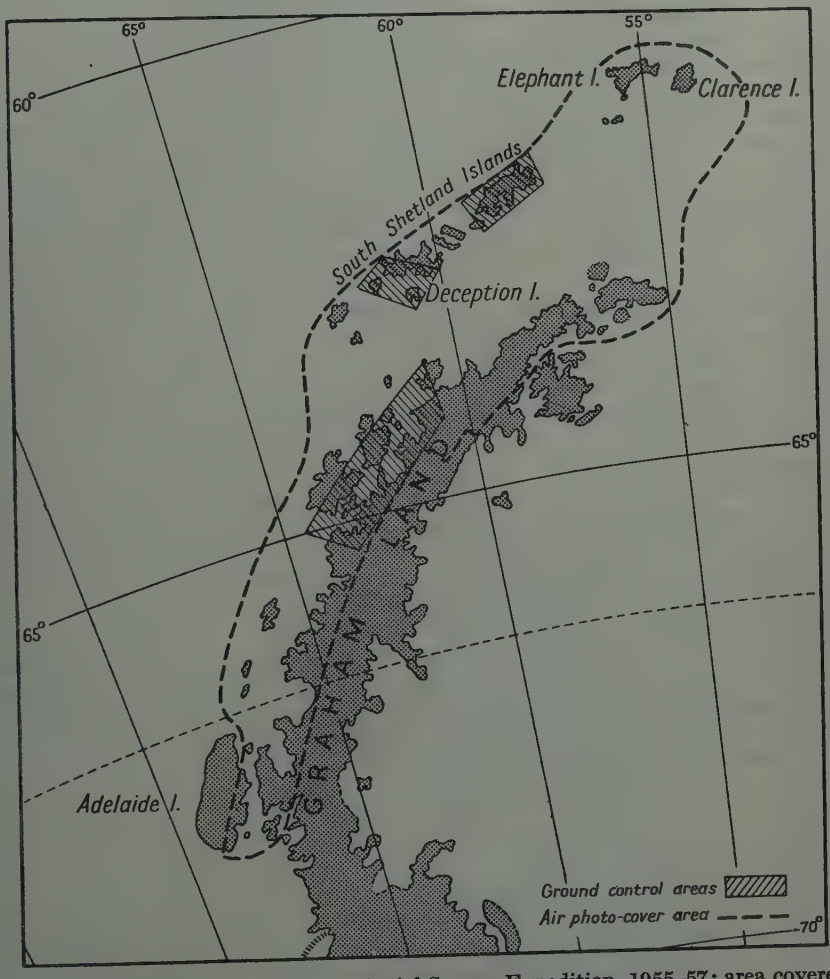
The aircraft flew from Port Stanley to Deception Island on 9 December and, 2 days later, were ready to begin work. During the operational period of 79 days there were 16 days suitable for air photography. A comparison with weather conditions during the previous season shows that December, with more settled weather

and total absence of darkness, is the most suitable month for air photography in this region:

	Days suitable for air photography	
	1955–56	1956–57
December	12	12
January	5	6
February	7	3
Total	24	21

The aircraft flew a total of 240 hours, and 10,753 effective exposures were taken.

As in the previous season the camera installation consisted of an Eagle IX, 6 in. focal length vertical camera, and a fixed F24, 3½ in., f. 1 oblique camera at an angle of 30° to the horizontal, either to port or starboard. All exposures were made with stop f. 11, the exposure times varying over the day from $\frac{1}{200}$ to $\frac{1}{50}$ sec. During



Falkland Islands and Dependencies Aerial Survey Expedition, 1955–57: area covered by survey.

December, and the first half of January, it was possible to take photographs from 8 a.m. to 8 p.m.

The helicopter was used in connexion with the ground control work of the expedition. The first machine crashed on the second day of operation, and it was not until 24 January 1957 that a replacement could be brought into use. In the course of the season, however, the machines flew 417 sorties in 52 hours flying time, transporting 181 passengers and 28,370 lb. of equipment. They gave no mechanical trouble.

The loss of the first helicopter once more prevented the completion of the plan to link the South Shetland Islands to the mainland of Graham Land by trigonometrical observations; weather conditions had frustrated this in March 1956. While *Oluf Sven* was fetching the second helicopter from Montevideo, the survey team carried out the triangulation of part of King George Island. After the arrival of the second helicopter the survey was completed and extended to cover Nelson Island. The main work of the survey party was the triangulation of a section of Danco Coast. This was carried out from *Oluf Sven* with the help of the helicopter. In about 6 weeks, starting on 27 January 1957, a total of 130 miles of coastline was triangulated and 84 control points fixed, of which 24 were occupied stations. The area included Hughes Bay and Gerlache Strait as far south as Cape Renard.

Some hydrographic work was undertaken during the survey cruises of *Oluf Sven*. This included 900 miles of soundings in Hughes Bay, the southern end of Gerlache Strait, Orléans Channel, Davies Gilbert Strait and to the east of Tower Island. The existence was proved of a channel between Hughes Bay and Charlotte Bay, east of Cape Murray and west of Salvesen Cove. This channel, referred to in early whalers' reports as "Graham's Passage", was reported as non-existent in 1955. It was found to be not less than ¼ mile wide and over 200 fathoms deep throughout the entire length.

Meanwhile the "Cansos" had left Deception Island on 3 March and reached Toronto on 3 April. They had again proved very satisfactory and had no serious mechanical troubles during the season.

Oluf Sven returned to Deception Island from the survey cruise on 20 March, reloaded, and left the island with the expedition on the 30th, arriving back in Harwich on 13 May.

During the 1955–56 season the best month for flying, December, had been spent in constructing the base camp and aircraft installations, with the result that only 1000 sq.miles were covered by air photography out of a contract area of 40,000 sq.miles. In December 1956, with the base and ancillaries already built, air photography began on the 14th, and the total coverage by the end of the season was about 33,000 sq.miles, or 80 per cent of the contract area.

Experience gained in the two seasons suggests that the practical limit of air photography by "Canso" aircraft based on Deception Island is lat. 68° S. This limit could only be reached on a few days in December and early January, when exceptional weather conditions permitted the aircraft to make flights of 10 hours duration. No harbour south of Deception Island was found which would be safe for the operation of a large flying boat for any length of time.

Falkland Islands and Dependencies Aerial Survey Expedition, 1955–57;
Emma Island, Gerlache Strait

Photograph by Hunting Aerosurveys Ltd.

APPENDIX. *Members of the Falkland Islands and Dependencies Aerial Survey Expedition*, 1956–57

Hunting Aerosurveys Ltd.

P. G. Mott, Expedition leader, survey manager
J. H. Saffery, Deputy leader, flying manager
A. H. Arkinstall, Senior ground photographer
A. D. Bancroft, Senior surveyor
C. C. Brown, Surveyor
R. W. Brumwell, Co-pilot, "Canso" CF-IJJ
J. J. Cheal, Surveyor, stores officer
P. E. Davis, Air camera operator
W. Freeman, Air camera operator, press photographer
C. B. Gavin-Robinson, Captain, "Canso" CF-IJJ
E. G. H. Green, Air photographer, "Canso" CF-IJJ
M. Kane, Assistant engineer
R. Keen, Engineer, "Canso" CF-IJJ
J. F. Marsh, Marine engineer
A. J. Rennie, Surveyor
J. D. L. Symington, Senior air photographer
R. A. Wood, Assistant ground photographer

Seconded from Kenting Aviation Ltd.

C. Grant, Co-pilot, "Canso" CF-IGJ
P. Nielsen, Engineer, "Canso" CF-IGJ
R. N. Pettus, Captain, "Canso" CF-IGJ

Seconded from Government Services

Falkland Islands Meteorological Service

B. Powell, Meteorological forecaster

Falkland Islands Dependencies Survey

Dr H. G. Harding, Medical officer
D. B. Exley, Cook
G. A. Stride, Steward
J. Noble, Survey assistant

Sub-contractors

Autair Ltd.

B. G. Davey, Assistant helicopter engineer
G. L. Jacques, Helicopter captain
J. Patcha, 1st engineer and co-pilot

International Aeradio Ltd.

R. M. McWhirter, Marine radio officer
M. R. Milburn, Air traffic control officer
J. Moffat, Radio officer.

Falkland Islands and Dependencies Aerial Survey Expedition, 1955–57; Cape Anna, Gerlache Strait

Photograph by Hunting Aerosurveys Ltd.

NOTES

THE AREA AND DISTRIBUTION OF GLACIERS IN THE ARCTIC

[Summarized from an article by R. P. Sharp in *Arctic*, Vol. 9, Nos. 1 and 2, 1956, p. 78–117.]

Greenland

The ice cover of Greenland, the largest in the Arctic, consists of the Greenland ice sheet and some independent ice caps, also a variety of glaciers and, in places, an ice foot. The area of the Greenland ice sheet, which covers 79 per cent of the island, is about 665,000 sq.miles (1,129,000 sq.km.). It is about 1570 miles (2512 km.) long and 600 miles (960 km.) wide. The total ice cover, including independent glaciers and ice on nearby islands, is estimated at from 696,000 to 733,000 sq.miles (1,809,600 to 1,905,800 sq.km.) which represents 82·5 to 87 per cent of the land.

Iceland

The total area of ice is about 4700 sq.miles (12,220 sq.km.) and it covers one-eighth of the land. There are a number of ice caps on the island of which the largest is Vatnajökull, covering 3050 sq.miles (7930 sq.km.); others are Hofsjökull, 502 sq.miles (1305 sq.km.), Langjökull, 464 sq.miles (1206 sq.km.) and Myrdalsjökull 386 sq.miles (1003 sq.km.).

Jan Mayen

Glaciers cover 45 sq.miles (117 sq.km.) of this island, and are limited to Beerenberg.

Svalbard

In Svalbard glaciers cover about 22,000 sq.miles (57,200 sq.km.) or 80 to 85 per cent of the land. In Vestspitsbergen there are three main areas of ice, Torell Land in the south, in the north-west, and in Ny Friesland in the north-east. In Nordaustlandet there are also three distinguishable ice bodies: Vestfonna, Austfonna and Sørfonna. Vestfonna, 1080 sq.miles (2808 sq.km.), is separated from Austfonna, 2150 sq.miles (5590 sq.km.) by the open valley joining the heads of Rijpfjorden and Wahlenbergfjorden. Sørfonna, 910 sq. miles (2366 sq.km.) is separated from Austfonna by a long ice-filled depression, but each mass has its own separate domes.

Barentsøya and Edgeøya have ice caps covering 600 to 1200 sq.miles (1560 to 3120 sq.km.), and there are ice caps on Storøya, Kvitøya, Svenskøya and Kongsøya. There are two glaciers on Prins Karls Forland.

Novaya Zemlya

The area of ice is 11,500 sq.miles (29,900 sq.km.) covering about 30 per cent of the land.

Zemlya Frantsa-Iosifa

Most of the islands of this group have extensive if not complete ice cover amounting to 6560 sq.miles (17,056 sq.km.) or 85 to 93 per cent of their total area; and mainly in the form of ice caps.

Severnaya Zemlya

The four principal islands of this group all have extensive ice caps, but the smaller islands are reported to be ice free. Ostrov Komsomolets has two ice caps totalling 2468 sq.miles (6417 sq.km.), or 65 per cent of the land; on Ostrov Pioner the ice cap covers 150 sq.miles (390 sq.km.); on Ostrov Oktyabr'skoy Revolyutsii there are four ice caps totalling 2243 sq.miles (5832 sq.km.), 45 per cent of the land; and on Ostrov Bol'shevik two ice caps totalling 1275 sq.miles (3315 sq.km.) cover 21 per cent of the land. In the group a total of about 6400 sq.miles (16,640 sq.km.), or 42 per cent of the land, is covered by ice.

Other Siberian Islands

Ostrov Bennet, north-east of the Novosibirskiye Ostrova, has an ice cap from which several small glaciers descend to the coast. Islands of the Ostrova De-Longa are said to have ice caps, and Ostrov Vrangelya to have glaciers.

Scandinavia

Scandinavian glaciers, though the largest in Europe, cover only 2416 sq.miles (6282 sq.km.) of which 310 sq.miles (806 sq.km.) are in Sweden and the rest in Norway. The largest are the Jostedal glacier field 785 sq.miles (2041 sq.km.), Folgefonna 108 sq.miles (260 sq.km.) and Svartisen which has an area of about 175 sq.miles (455 sq.km.).

U.S.S.R.

Some small glaciers have been discovered in the vicinity of Gora Sablya. In eastern Siberia a number of glaciers, all small, are scattered in the complex mountain systems between the Lena and the Pacific.

Alaska

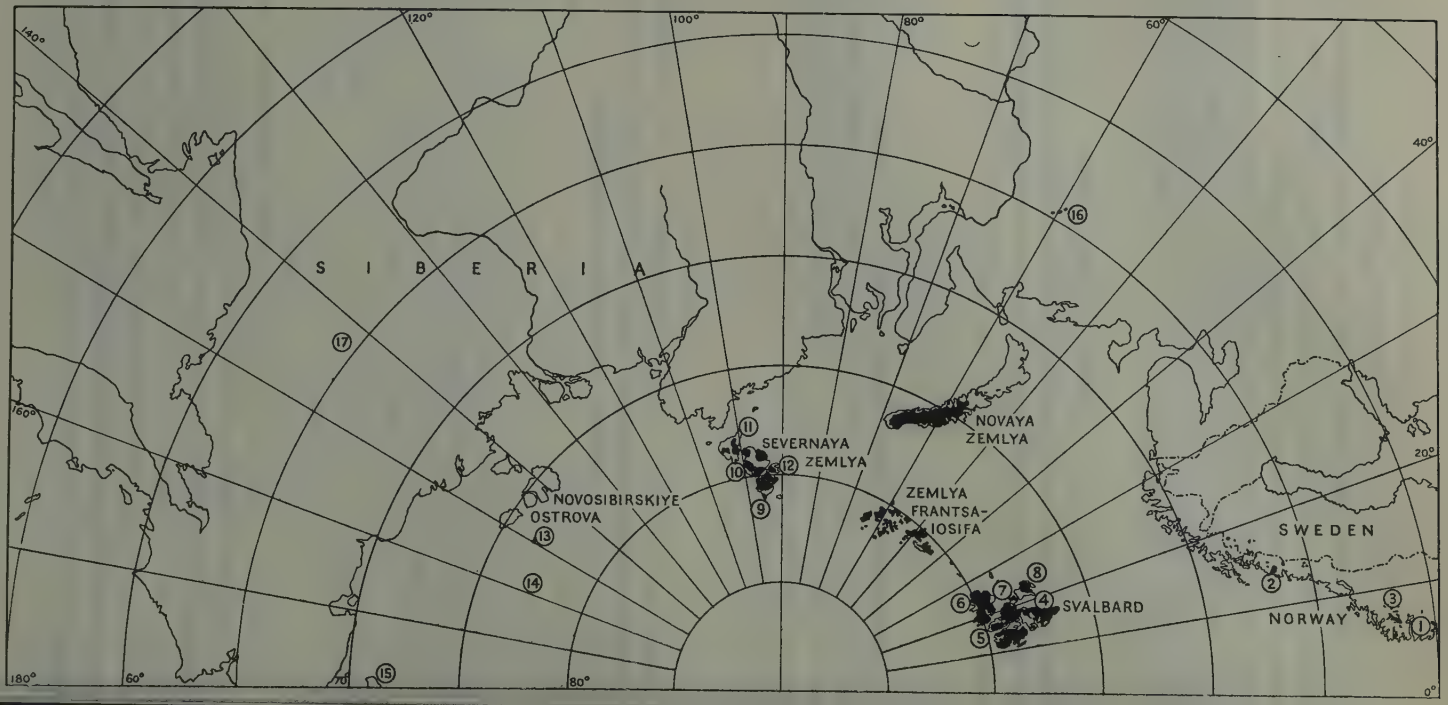
The glaciers of Alaska and adjoining parts of Canada are all sub-polar. They are most numerous in the Coast Mountains, as far south as lat. 56° 30′ N., the St Elias Mountains, the Chugach Mountains, the Kenai Mountains and the Aleutian Range. The total ice coverage in Alaska is about 20,000 sq.miles (52,000 sq.km.) or slightly more than 3 per cent of the territory.

Canada

Glaciers are found in two areas of continental Canada, and in neither are they large or of any importance. A few small glaciers lie in the Torngat and Kaumajet Mountains of north-eastern Labrador. Others exist in the Cordillera, near the divide between the Yukon and Mackenzie Rivers, in the Selwyn and Mackenzie Mountains, in the south-east part of the Ogalvie Mountains, the southern Selwyn Mountains and in the higher ranges of the Yukon Plateau. The total area, however, is only about 5300 sq.miles (13,680 sq.km.).

EASTERN HEMISPHERE

1. Folgefonna
2. Svartisen
3. Jostedal glacier field
4. Torell Land
5. Ny Friesland
6. Nordaustlandet
7. Barentsøya
8. Edgeøya
9. Ostrov Komsomolets
10. Ostrov Oktyabr'skoy Revolyutsii
11. Ostrov Bol'shevik
12. Ostrov Pioner
13. Ostrov Bennet
14. Ostrova de-Longa
15. Ostrova Vrangelya
16. Ural
17. Khrebet Cherskogo



WESTERN HEMISPHERE

1. Coast Mountains
2. St Elias Mountains
3. Chugach Mountains
4. Kenai Mountains
5. Aleutian Range
6. Selwyn Range
7. Mackenzie Range
8. Ogilvie Mountains
9. Ellesmere Island
10. Baffin Island
11. Barnes Ice Cap
12. Bylot Island
13. Devon Island
14. Axel Heiberg Island
15. Meighan Island
16. Melville Island

Ellesmere Island

Ellesmere Island is divided into four by long fjords indenting the east a west coasts, and each section has an independent ice cap. The total cover about 32,000 sq.miles (83,200 sq.km.) or 40 per cent of the land.

Baffin Island

The main ice cover in Baffin Island is along the east coast, and the Barn Ice Cap, about 50 miles (80 km.) inland, in about the centre of the island. T coverage is about 14,100 sq.miles (36,660 sq.km.).

Smaller islands

Bylot Island is about 50 per cent covered by an ice cap of 2000 sq.mil (5200 sq.km.) with outlet glaciers descending on all sides. Devon Island h 6270 sq.miles (16,302 sq.km.) of ice cover, Axel Heiberg Island, 3600 sq.mil (9360 sq.km.), Meighen Island about 35 sq.miles (91 sq.km.) and Melvil Island about 100 sq.miles (260 sq.km.).

RESEARCH ON ANTI-ICING PRECAUTIONS FOR SHIPS

[Summarized from an unpublished report *Trawler-icing research*, issued by the Council the British Shipbuilding Research Association, London, 1957 (Report No. 221), and inform tion from Messrs Cook, Walton and Gemmell Ltd., Hull.]

As a result of the loss of the trawlers *Lorella* and *Roderigo* in Arctic wate early in 1955, an investigation into the icing of trawlers was initiated by t British Shipbuilding Research Association. The object was to study the natu and effect of icing conditions, such as might be encountered by trawle fishing in northern waters.

A series of experiments were carried out on behalf of the association Vickers-Armstrong Ltd. at Weybridge. A $\frac{1}{12}$ scale model of a steam trawl 180 ft. (55 m.) B.P. and 30 ft. 6 in. (9 m.) B. mld. was used for the experimen complete with all superstructures, major deck fittings and permanent riggi It was floated in a tank in a cold chamber. The required conditions we created by injecting water into the chamber by simple compressed air a water sprays. Water temperature was maintained at about 34° F. (1·1° and air temperature at 14° to 21° F. (−10° to −6·1° C.). A wind spe representing 45 to 55 knots was reproduced. Permanent ballast was carri to give the displacement, trim and stability expected under working con tions. Tests were carried out when the model was in three positions, head wind, stern to wind, and 30° off wind, and first with full normal rigging, th repeated with a tripod mast. The last position, the most serious from the poi of view of stability, was an attempt to reproduce conditions on a trawler wh "dodging" out of the wind.

With head to wind the model iced steadily until it collapsed. It was fou that the greatest weight of ice that it could carry and yet remain upright

calm water, was equivalent to about 145 tons on a full sized ship. The distribution of the ice was roughly as follows:

Part of ship	Weight of ice in tons
Standing rigging	17·5
Forward derrick and pivot (stowed)	1·25
"Clutter" at joints	2·25
Derrick and stays (aft of main mast)	2·25
Fish tackles	2
Landing span, aerials, etc.	1
Boats and davits	3
Forecastle rails	8
Main mast	1
Radar tower, rails and compass	6
Mizzen mast	0·75
	45·00
Forecastle deck, windlass, etc.	20
Superstructure	10
Main deck, boat deck, and rails	70
	100

The centre of gravity of the ice was 30 ft. above deck. In tests with the model stern to wind there was a heavy ice build-up aft, and very little forward, of the bridge. When the model was 30° to the wind it iced rapidly on the windward side, and heeled over into the wind. The total weight of ice formed before the model capsized was less than in the first position.

The loss of stability varies with the position of the ship to the wind. Head to wind, and with normal rigging, the rate of loss of metacentric height in the full-sized ship is roughly linear for the first 100 tons of ice deposited. It then falls off, and reaches a maximum loss of approximately 17 in. when 150 tons have been deposited. If it is assumed that the metacentric height of the ship without ice is about 20 in. it is clear that it is in danger of capsizing. With the model stern to wind the loss of metacentric height, for a given weight of ice, is about half that which occurs when the model is head to wind. This is due to the screening of the foremast by the superstructure. The centre of gravity of the ice is equivilant to about 7 ft. below that in the first position. With the model heading 30° off the wind, ice settled on the windward side causing her to heel into the wind. This in turn caused more ice to be deposited high up in the rigging, and the model finally capsized under less than half the ice carried when head to wind. With the tripod mast, in the head to wind position and for a given weight of ice, the loss in metacentric height was only two-thirds of the loss with normal rigging, and the centre of gravity equivilant to about 5 ft. lower.

Various conditions of spray and wind velocity were reproduced to determine the effects of different rates of icing on the distribution and mass of ice deposited. Visual observations, and the result of inclining experiments, showed that the relation between these factors is independent of the rate of icing and of the speed of the wind.

Experiments were also carried out to test the relative ice accretion on full-sized wire shrouds, tubular mast stays and struts.

The most dangerous form of icing at sea is from freezing spray blown over a

ship. This is known as 'glaze' ice and is the commonest type of icing encou tered. It has a high density and great powers of adhesion. "Glaze" ice is m with whenever the air temperature is below the freezing-point of sea wat (about 28·4° F. or −2° C.), and the wind is strong enough to blow spray fro the wave crests and from the water broken up mechanically by the passage the ship through the sea. Conditions for the formation of ice are therefo determined by air temperature, the amount of water blown on to the shi and the size of the droplets of water. Figures are available for the first of the factors only. Typical conditions for its formation are:

Air, and initial ship, temperature	20° to 25° F. (−6·3° to −3·9° C.)
Wind speed	Force 6, and above
Sea temperature	30° to 34° F. (−1·1° to 1·1° C.)

At temperatures below 0° F. (−17·7° C.) the water striking the ship will in the form of small, dry ice crystals, and will therefore not adhere to the co ship.

Freezing rain will produce fresh-water "glaze" ice, but it is seldom met wi in sufficiently large quantities to be a source of danger.

Sea ice, from "green" water taken over the side of the ship, will not free readily unless trapped on deck by ice-choked rails and freeing ports.

Ice tends to form high up on a ship, on the masts and rigging, and results loss of freeboard and stability. The large area of ice built up, particular around and ahead of the foremast, acts as a sail, and curtails the ship manoeuvrability.

The experiments showed that certain modifications in design might considered in order to reduce the rate at which ice will form on a ship. A tripo mast might be substituted for the normal foremast and rigging. A light allo or fibreglass-resin mast, stayed to the funnel, might replace the normal mizz mast. As much of the rigging and superstructure excrescences might eliminated as possible. Wire ropes might replace rails wherever feasible and placed as far inboard as possible, to reduce the catchment area, particular on the forecastle deck, created by rails freezing solid. All movable riggin such as derricks, might be lowered as much as possible in order to lower t centre of gravity of the ice deposited on them. Hulls might be designed increase freeboard and metacentric height.

A trawler, *Cape Trafalgar*, has recently been built by Messrs Cook, Walt and Gemmell Ltd., of Hull, which embodies a number of the modificatio suggested in the report on these investigations issued by the British Shi building Research Association. The hull design gives better freeboard a stability to enable the ship to be brought round to run before the wind wi greater safety. The structures amidships have been made as small as possib and streamlined. The mainmast is supported by tubular stays in place normal wire stays and shrouds. The rails of the forecastle deck are broug inboard as far as possible to reduce the potential catchment area. One lifebo only is carried, and this is on the centreline under a single-arm davit. T icing target presented by the normal two lifeboats, under patent davits a

one on each side of the ship, is thus considerably reduced. The second lifeboat is replaced by inflatable rubber dinghies. Other details of *Cape Trafalgar* are:

Length B.P.	185 ft.
Breadth mld.	33 ft. 6 in.
Depth to main deck	16 ft. 9 in.
Minimum freeboard and metacentric height, loaded	3 ft. 5 in. and 35 in.
Minimum freeboard and metacentric height, unloaded	7 ft. 2 in. and 27 in.
Tonnage, gross	787

NINTH MEETING OF THE INTERNATIONAL WHALING COMMISSION, 1957

[Summarized from *Norsk Hvalfangst-Tidende*, Årg. 46, No. 7, 1957, p. 390–94 and No. 8, 1957, p. 438–62.]

The ninth meeting of the International Whaling Commission was held in London from 24 to 28 June 1957. Dr G. J. Lienesch (Netherlands), chairman of the Commission, presided and representatives of all seventeen contracting governments,[1] except Panama, were present. Argentina, Italy and Portugal were represented by observers as were the Food and Agriculture Organization of the United Nations Organization and the International Council for the Exploration of the Sea.

A review of the 1956–57 Antarctic season was given by the Bureau of International Whaling Statistics. Twenty factory ships with 225 catchers took part (one factory ship more, but 32 catchers less, than in 1955–56). Operations for baleen whales began on 7 January and ended on 16 March. The total pelagic catch was 28,596 baleen whales and 4345 Sperm Whales from which were produced 1,883,205 barrels of whale oil and 214,706 barrels of sperm oil (at 6 barrels to the ton). By-products totalled 126,550 tons. The former sanctuary in the Pacific sector (between longs. 70° and 160° W.), which was first opened in 1955–56, contributed 39·7 per cent of the pelagic baleen whale catch, as compared with 24·9 per cent in 1955–56, and there was a corresponding reduction in the catch from the older areas. Only 17·3 per cent of the catch was taken in areas III, IV and V, most expeditions concentrating on the former sanctuary and area II.

The most important question to be considered by the Commission was that of the Antarctic pelagic quota for 1957–58. According to the provisions of the Convention the maximum catch shall not in any season exceed 15,000 Blue Whale units. The Scientific Committee (one member dissenting) expressed the view that "although there is not conclusive proof of a heavy decline in the stocks of Fin Whales, they considered that the balance of evidence is sufficient to justify a warning that the present number of whales taken annually in the

[1] Australia, Brazil, Canada, Denmark, France, Iceland, Japan, Mexico, the Netherlands, New Zealand, Norway, Panama, South Africa, Sweden, the United Kingdom, the U.S.S.R. and the United States.

Antarctic is dangerously high". The Commission resolved that the quota fo 1957–58 should again be 14,500 Blue Whale units as in the 1956–57 seasor This represents a compromise between the needs of the industry and th scientific advice. Japan and the Netherlands were in favour of a higher quot

It was decided that the opening dates of the season for the different specie should remain unchanged. The Commission considered a Norwegian propos for an increase in the catch of Humpback Whales in the Antarctic. This wa supported by all the countries which send pelagic expeditions to the Antarcti but, the necessary three-quarter majority not being obtained, the proposal wa defeated.

At the Seventh meeting of the Commission in Moscow it was resolved tha the Pacific sector, formerly a sanctuary, should be opened for a period of thre years from 1955–56 to 1957–58. At the last meeting this period was extende to the 1958–59 season, the object being to lessen the strain on the stocks c whales in the older whaling areas, a policy which has already met with succes

The United States Commissioner reported that the Protocol amending th Convention so as to permit the appointment of independent observers i addition to national inspectors had not yet been ratified by all the contractin governments. It is hoped that the necessary signatures will be obtained i time for action to be taken at the tenth meeting.

Refrigerating ships have formerly been included in the term "factory ship" and by the terms of the Convention factory ships may not be used in othe fields within a period of one year after taking part in Antarctic whaling. Th Commission has now revised the Convention so that this restriction does nc apply to refrigerating ships.

The expenses of the Commission for the Budget Year 1956–57 were £311 a remarkably low figure for an international organization of this kind. It wa decided that the annual subscription from each contracting government shoul be raised from £150 to £200.

The Commission will continue to support whale marking. The Scientifi Committee reported that about 275 whales were marked in the Antarctic i the 1956–57 season, mostly prior to the opening of the baleen whaling seasor Off the coasts of Australia and New Zealand 500 whales were marked in 195 In the recent Antarctic season 56 marks were recovered, including one whic had been carried by a Fin Whale for 22 years. A Humpback Whale marke off the east coast of Australia was captured off New Zealand, demonstratin a connexion between these two stocks. Another Humpback marked off th Tonga islands was recovered in the eastern part of the Pacific sector of th Antarctic.

The next meeting of the Commission will be held at The Hague on 23 Jun 1958, and the Scientific Sub-Committee will meet in March 1958.

GROWTH OF TREES NEAR THEIR NORTHERN LIMIT

A conference was held in the U.S.S.R. in 1955 on tree growth in the Arctic. The resulting volume of collected papers[1] brings together new Soviet work on the tree line: why it is in its present position, how long it has been there, what conditions are required to make it move, and what can be done to stimulate tree growth in this region. The tree line is taken to mean the northern edge of the so-called wooded tundra, the belt of sparse tree growth, up to 150 km. wide, which lies between the treeless tundra and the coniferous forest proper, or *tayga*. The objects of the inquiry are to establish rational conservation policies and to examine the possibility of planting shelterbelts.

Investigations have shown that the tree line in the Soviet Arctic at the time of the post-glacial climatic maximum was on average about 250 km. north of its present position. L. N. Tyulina[2, 3] and others have demonstrated that the climate to-day is capable of inducing northward movement again, although views differ as to for how long and at what speed this process has been going on. Recent research[4, 5] has inclined Soviet botanists to the belief that the treelessness of the tundra is not caused by deficiencies in the soil, as was thought earlier. It is due to low-speed production (trees probably only fruit every 10 years), poor quality seeds, inhibition of their growth by mosses and lichens, and destruction of saplings by animals.

How then is growth in the wooded tundra and beyond to be encouraged? Felling must be controlled, so that total clearance of an area is avoided, and belts of trees should be left standing to act as shelterbelts, encouraging re-growth. Care must be taken to leave the healthiest fruiting trees. Moss should be scraped away from the earth surrounding them as, besides giving the seeds a better start, this has the effect of increasing by a factor of two or three the depth to which the soil thaws in summer. Indiscriminate felling around settlements in wooded tundra has been leading to local southwards movement of the tree line, counteracting the natural northwards movement. Reindeer must be prevented from rubbing their antlers on the young trees; it has been estimated[4] that in some areas over three-quarters of the casualties among young trees are due to damage by reindeer. Other recommended measures include regulation of soil temperature by artificially increasing or retaining snow cover, drainage, burning dead grass and moss on the ground, attention to biological and microbiological processes in the soil, choosing suitable varieties of tree, and working out appropriate planting plans (for example, planting tree seeds under the protection of bushes).

There have been successful experiments in afforestation at Nar'yan-Mar, Potapovo, Salekhard, and along the Pechora railway (all wooded tundra areas), Berezovo and Igarka (northern *tayga*), and Khanty-Mansiysk (central *tayga*). At Nar'yan-Mar experimental planting of shelterbelts has been proceeding since 1950. Several species of tree have been planted, but chiefly Siberian spruce (*Picea obovata*) and Siberian larch (*Larix sibirica*). The method was to transplant saplings from the vicinity. Along the Pechora railway near Vorkuta natural re-growth of Siberian spruce was observed in a climate in

which the annual mean temperature was −6·3° C., the mean for the colde month below −20° C. and for the hottest month +12° C., with annu precipitation of 35 to 40 cm., half of which falls in the growing period. He growing from seed was recommended, but measures were also taken to provi saplings by setting up local nurseries.

Growth is slow in the wooded tundra. It has been found that the tw commonest trees in the Nar'yan-Mar area, Siberian spruce and Siberian larc reached a height of 110 to 120 cm. after 23 to 26 years. The maximum heig of 6 to 8 m. may take well over 100 years to reach, but reaching it depen more upon the surroundings of the tree (for instance, whether it is in a group standing alone) than upon age.

References

[1] Okhrana lesov na ikh severnom predele i zashchitnoye lesorazvedeniye v tund [Preservation of forests at their northern limit and protective afforestation in the tundra *Rastitel' nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of t U.S.S.R. and its Utilisation*], Vypusk 1, 1956, 100 p.

[2] Tyulina, L. N. O lesnoy rastitel'nosti Anadyrskogo kraya i yeye vzaimootnosheni tundroy [Forest growth of Anadyrskiy Kray and its relation with the tundra]. *Tru Arkticheskogo Instituta* [*Transactions of the Arctic Institute*], Tom 40, 1936, p. 7–212.

[3] Tyulina, L. N. Lesnaya rastitel'nost' Khatangskogo rayona u yeye severnogo prede [Forest growth of the Khatanga region at its northern limit]. *Trudy Arkticheskogo Institu* [*Transactions of the Arctic Institute*], Tom 63, 1937, p. 83–180.

[4] Andreyev, V. N. Prodvizheniye drevesnoy rastitel'nosti v tundru v svyazi s z shchitnymi svoystvami lesoposadok na severe [Movement of forests into the tundra in co nection with the protective properties of plantations in the north]. *Botanicheskiy Zhurn* [*Botanical Journal*], Tom 39, No. 1, 1954, p. 28–47.

[5] Tikhomirov, B. A. Bezlesiye tundry i yego preodoleniye [Treelessness of the tund and how to overcome it]. *Botanicheskiy Zhurnal* [*Botanical Journal*], Tom 38, No. 4, 195 p. 513–29.

SOVIET BIOLOGICAL STATION ON THE BARENTS SEA

[From Kamshilov, M. M. Murmanskaya biologicheskaya stantsiya [Murman biologic station], in *Priroda* [*Nature*], 1957, No. 3, p. 59–63.]

The Murman Biological Station [Murmanskaya Biologicheskaya Stantsiy is the oldest-established scientific institution serving the Soviet Arctic. It w set up in 1899 at Aleksandrovsk (now Polyarnyy) on the Murman coast, abo 20 miles from the modern Murmansk. From the first, the station's task w marine biology, with special emphasis on fisheries research, and its sphere action was the Barents Sea. Almost all Soviet marine biologists have be associated at some time with the station.

At first it worked in close conjunction with the Murman Scientific–Industri Expedition [Murmanskaya Nauchno–Promyslovaya Ekspeditsiya], an orga zation directed by N. M. Knipovich with somewhat similar aims but great emphasis on the economic side. The two institutions between them laid t scientific foundations for the Russian fishery in the Barents Sea and Nor Atlantic. The Murman Scientific–Industrial Expedition was wound up in 19 for lack of funds.

The early work of the station owed much to G. A. Klyuge, who w Director from 1908 to 1932. His predecessors were A. K. Linko (1899–190 K. M. Deryugin (1903–04) and S. V. Averintsev (1904–08). The station h

to close during the First World War and the civil war which followed, but it was reopened in 1920.

The name of the station was changed in 1929, when it combined with the Floating Marine Scientific Institute [Plovuchiy Morskoy Nauchno-Issledovatel'skiy Institut] to form the Murman branch of the State Oceanographical Institute [Gosudarstvennyy Okeanograficheskiy Institut]. This in turn was renamed in 1933 the N. M. Knipovich Polar Research Institute of Sea Fisheries and Oceanography [Polyarnyy Nauchno-Issledovatel'skiy Institut Morskogo Rybnogo Khozyaystva i Okeanografii imeni N. M. Knipovicha, abbreviated to PINRO], which exists to-day.

In 1935, however, it was decided to create a new Murman Biological Station, for which premises were to be built at Dal'niye Zelentsy, about 100 miles eastwards along the coast from the previous location. The Academy of Sciences of the U.S.S.R. [Akademiya Nauk SSSR] was made responsible for the Station, and Academician S. A. Zernov was appointed Director. The building programme was interrupted by the war, during which the station was evacuated to Tadzhikistan, but it was continued afterwards. The station is now directed by M. M. Kamshilov. It has two research ships, the motor boat *K. Deryugin* and the small trawler *Diana*. The scope of the work has always remained substantially the same. The central problem now is the biological productivity of the Barents Sea.

NORTH PACIFIC FUR SEAL CONFERENCE, 1955–57

[*North Pacific Fur Seal Conference, Washington, D.C., 28 November 1955.* Documents Nos. 3 and 223, 1956, 1957.]

A conference on the conservation of North Pacific Fur Seals (*Callorhinus ursinus*) was held in Washington between 28 November 1955 and 21 February 1957. Member nations taking part were Canada, Japan, U.S.S.R. and the United States. An Interim Convention on conservation of North Pacific Fur Seals was signed by delegates from the four nations, and will enter into effect upon the deposit in Washington of ratifications by the governments concerned.

The terms of the convention are as follows:

Article I

1. The term "pelagic sealing" is hereby defined for the purposes of this Convention as meaning the killing, taking, or hunting in any manner whatsoever of Fur Seals at sea.

2. The words "each year", "annual" and "annually" as used hereinafter refer to Convention year, that is, the year beginning on the date of entry into force of the Convention.

3. Nothing in this Convention shall be deemed to affect in any way the position of the Parties in regard to the limits of territorial waters or to the jurisdiction over fisheries.

Article II

1. In order to realize the objectives of this Convention, the Parties agree to coordinate necessary scientific research programs and to cooperate in investigating the Fur Seal resources of the North Pacific Ocean to determine:

(*a*) what measures may be necessary to make possible the maximum sustainab productivity of the Fur Seal resources so that the Fur Seal populations can brought to and maintained at the levels which will provide the greatest harve year after year; and

(*b*) what the relationship is between Fur Seals and other living marine resourc and whether Fur Seals have detrimental effects on other living marine resourc substantially exploited by any of the Parties and, if so, to what extent.

2. The research referred to in the preceding paragraph shall include studies of t following subjects:

(*a*) size of each Fur Seal herd and its age and sex composition;

(*b*) natural mortality of the different age groups and recruitment of young to ea age or size class at present and subsequent population levels;

(*c*) with regard to each of the herds, the effect upon the magnitude of recruitme of variations in the size and the age and sex composition of the annual kill

(*d*) migration routes of Fur Seals and their wintering areas;

(*e*) numbers of seals from each herd found on the migration routes and in winteri areas and their ages and sexes;

(*f*) extent to which the food habits of Fur Seals affect commercial fish catches a the damage Fur Seals inflict on fishing gear; and

(*g*) other subjects involved in achieving the objectives of the Convention, determined by the Commission established under Article V, paragraph 1.

3. In furtherance of the research referred to in this Article, each of the Parti agrees to carry out, each year after the entry into force of the Convention, t programs set forth in the Schedule annexed to the Convention with any modific tions thereof made pursuant to Article V, paragraph 3. The said Schedule, togeth with any such modifications, shall be considered an integral part of this Conventio

4. Each Party agrees to provide the Commission annually with information o

(*a*) number of black pups tagged for each breeding area;

(*b*) number of Fur Seals, by sex and estimated age, taken at sea and on ea breeding area; and

(*c*) tagged seals recovered on land and at sea;

and, so far as is practicable, other information pertinent to scientific research whi the Commission may request.

5. The Parties further agree to provide for the exchange of scientific personn each such exchange shall be subject to mutual consent of the Parties direct concerned.

6. The Parties agree to use for the scientific pelagic research provided for in t Article only government-owned or government-chartered vessels operating und strict control of their respective authorities. Each Party shall communicate to t other Parties the names and descriptions of vessels which are to be used for pela research.

Article III

In order to realize the purposes of the Convention, including the carrying out the coordinated and cooperative research, each Party agrees to prohibit pela sealing, except as provided in Article II, paragraph 3, and the Schedule, in t Pacific Ocean north of the 30th parallel of north latitude including the seas Bering, Okhotsk, and Japan by any person or vessel subject to its jurisdiction.

Article IV

1. Each Party shall bear the expense of its own research. Title to sealskins tak during the research shall vest in the Party conducting such research.

2. If the total number of seals of the Commander Islands breeding grounds decreases and falls below 50,000 head, according to data in official records, then commercial killing of seals and apportionment of skins may be suspended by the Union of Soviet Socialist Republics until the number of seals exceeds 50,000 head. This provision also applies to the Fur Seal herd of Robben Island, if the population of that herd becomes less than 50,000 head.

3. The Government of the Union of Soviet Socialist Republics upon suspending such sealing shall so inform the other Parties. In this case the Commission shall determine whether or not to reduce the level of or to suspend completely the pelagic sealing for scientific purposes in the Western Pacific Ocean during the period of the said suspension.

4. The Commission may, subsequent to the second year of operation of the Convention, modify the floor figure set forth in paragraph 2 of this Article in accordance with its findings based upon scientific data received by it; and if any such modifications are made, paragraph 2 of this Article shall be considered amended accordingly. The Commission shall notify each Party of every such amendment and of the effective date thereof.

Article V

1. The Parties agree to establish the North Pacific Fur Seal Commission to be composed of one member from each Party.

2. The duties of the Commission shall be to:

(*a*) formulate and coordinate research programs designed to achieve the objectives set forth in Article II, paragraph 1;

(*b*) recommend these coordinated research programs to the respective Parties for implementation;

(*c*) study the data obtained from the implementation of such coordinated research programs;

(*d*) recommend appropriate measures to the Parties on the basis of the findings obtained from the implementation of such coordinated research programs, including measures regarding the size and the sex and age composition of the seasonal commercial kill from a herd; and

(*e*) recommend to the Parties at the end of the fifth year after entry into force of this Convention and, if the Convention is continued under the provisions of Article XIII, paragraph 4, at a later year, the methods of sealing best suited to achieve the objectives of this Convention; the above-mentioned later year shall be fixed by the Parties at the meeting early in the sixth year provided for in Article XI.

3. The Commission may, subsequent to the first year of operation of the Convention, modify in accordance with its scientific findings the research programs set forth in the Schedule and, if any such modifications are made, the Schedule shall be considered amended accordingly. The Commission shall notify each Party of every such amendment and of the effective date thereof.

4. Each Party shall have one vote. Decisions and recommendations shall be made by unanimous vote. With respect to any recommendations regarding the size and the sex and age composition of the seasonal commercial kill from a herd, only those Parties sharing in the sealskins from that herd under the provisions of Article IX, paragraph 1 shall vote.

5. The Commission shall elect from its members a Chairman and other necessary officials and shall adopt rules of procedure for the conduct of its work.

6. The Commission shall hold an annual meeting at such time and place as it may decide. Additional meetings shall be held when requested by two or more members

of the Commission. The time and place of the first meeting shall be determined b agreement among the Parties.

7. The expenses of each member of the Commission shall be paid by his ow Government. Such joint expenses as may be incurred by the Commission shall b defrayed by the Parties by equal contributions. Each Party shall also contribute t the Commission annually an amount equivalent to the value of the sealskins confiscates under the provisions of Article VI, paragraph 5.

8. The Commission shall submit an annual report of its activities to the Parties

9. The Commission may from time to time make recommendations to the Partie on any matter which relates to the Fur Seal resources or to the administration of th Commission.

Article VI

In order to implement the provisions of Article III, the Parties agree as follows

1. When a duly authorized official or any of the Parties has reasonable cause t believe that any vessel outfitted for the harvesting of living marine resources an subject to the jurisdiction of any of the Parties is offending against the prohibitio of pelagic sealing as provided for by Article III, he may, except within the territoria waters of another State, board and search such vessel. Such official shall carry special certificate issued by the competent authorities of his Government and draw up in the English, Japanese, and Russian languages which shall be exhibited to th master of the vessel upon request.

2. When the official after searching a vessel continues to have reasonable caus to believe that the vessel or any person on board thereof is offending against th prohibition, he may seize or arrest such vessel or person. In that case, the Party t which the official belongs shall as soon as possible notify the Party having jurisdic tion over the vessel or person of such arrest or seizure and shall deliver the vessel person as promptly as practicable to the authorized officials of the Party havin jurisdiction over the vessel or person at a place to be agreed upon by both Parties provided, however, that when the Party receiving notification cannot immediatel accept delivery of the vessel or person, the Party which gives such notification may upon request of the other Party, keep the vessel or person under surveillance withi its own territory, under the conditions agreed upon by both Parties.

3. The authorities of the Party to which such person or vessel belongs alone sha have jurisdiction to try any case arising under Article III and this Article and t impose penalties in connection therewith.

4. The witnesses or their testimony and other proofs necessary to establish th offense, so far as they are under the control of any of the Parties, shall be furnishe with all reasonable promptness to the authorities of the Party having jurisdiction t try the case.

5. Sealskins discovered on seized vessels shall be subject to confiscation on th decision of the court or other authorities of the Party under whose jurisdiction th trial of a case takes place.

6. Full details of punitive measures applied to offenders against the prohibitio shall be communicated to the other Parties not later than three months after th application of the penalty.

Article VII

The provisions of this Convention shall not apply to Indians, Ainos, Aleuts, Eskimos dwelling on the coast of the waters mentioned in Article III, who carry o pelagic sealing in canoes not transported by or used in connection with other vessel and propelled entirely by oars, paddles, or sails, and manned by not more than fiv

persons each, in the way hitherto practiced and without the use of firearms; provided that such hunters are not in the employment of other persons or under contract to deliver the skins to any person.

Article VIII

1. Each Party agrees that no person or vessel shall be permitted to use any of its ports or harbors or any part of its territory for any purpose designed to violate the prohibition set forth in Article III.

2. Each Party also agrees to prohibit the importation and delivery into and the traffic within its territories of skins of Fur Seals taken in the area of the North Pacific Ocean mentioned in Article III, except only those taken by the Union of Soviet Socialist Republics or the United States of America on rookeries, those taken at sea for research purposes in accordance with the Schedule, those taken under the provisions of Article VII, those confiscated under the provisions of Article VI, paragraph 5, and those inadvertently captured which are taken possession of by a Party; provided, however, that all such excepted skins shall be officially marked and duly certified by the authorities of the Party concerned.

Article IX

1. The respective Parties agree that, of the total number of sealskins taken commercially each season on land, there shall at the end of the season be delivered a percentage of the gross in number and value thereof as follows:

By the Union of Soviet Socialist Republics	to Canada	15 per cent
	to Japan	15 per cent
By the United States of America	to Canada	15 per cent
	to Japan	15 per cent

2. Each Party agrees to deliver such sealskins to an authorized agent of the recipient Party at the place of taking, or at some other place mutually agreed upon by such Parties.

3. In order more equitably to divide the direct and indirect costs of pelagic research in the Western Pacific Ocean, it is agreed:

(*a*) that in any year in which commercial killing is carried out for both the Commander and Robben Islands herds and pelagic research in that area is carried on at a level of 2000 or more seals:

(1) Canada and Japan will forego the delivery of the sealskins by the Union of Soviet Socialist Republics as set forth in paragraph 1 of this Article; and

(2) the United States of America will increase its delivery to Canada and Japan as set forth in paragraph 1 of this Article by a total of 375 sealskins to each of these Parties;

(*b*) that in any year in which commercial killing is carried out for one only of the Commander or Robben Islands herds and pelagic research in that area is carried on at a level of 1000 or more seals:

(1) Canada and Japan will forego the delivery of the sealskins by the Union of Soviet Socialist Republics as set forth in paragraph 1 of this Article; and

(2) the United States of America will increase its delivery to Canada and Japan as set forth in paragraph 1 of this Article by a total of 188 sealskins to each of these Parties.

Article X

1. Each Party agrees to enact and enforce such legislation as may be necessary to guarantee the observance of this Convention and to make effective its provisions with appropriate penalties for violation thereof.

2. The Parties further agree to cooperate with each other in taking such measu as may be appropriate to carry out the purposes of this Convention, including prohibition of pelagic sealing as provided for by Article III.

Article XI

The Parties agree to meet early in the sixth year of this Convention and, if Convention is continued under the provisions of Article XIII, paragraph 4, to m again at a later year, to consider the recommendations of the Commission made accordance with Article V, paragraph 2 (*e*), and to determine what further agr ments may be desirable in order to achieve the maximum sustainable productiv of the North Pacific Fur Seal herds. The above-mentioned later year shall be fixed the Parties at the meeting early in the sixth year.

Article XII

Should any Party consider that the obligations of Article II, paragraphs 3, 4, o or any other obligation undertaken by the Parties is not being carried out and not the other Parties to that effect, all the Parties shall, within three months of receipt of such notification, meet to consult together on the need for and nature remedial measures. In the event that such consultation shall not lead to agreem as to the need for and nature of remedial measures, any Party may give writ notice to the other Parties of intention to terminate the Convention and, notwi standing the provisions of Article XIII, paragraph 4, the Convention shall the upon terminate as to all the Parties nine months from the date of such notice.

Article XIII

1. This Convention shall be ratified and the instruments of ratification deposi with the Government of the United States of America as soon as practicable.

2. The Government of the United States of America shall notify the other sig tory Governments of ratifications deposited.

3. This Convention shall enter into force on the date of the deposit of the fou instrument of ratification, and upon such entry into force Article IX, paragraph and 2, shall be deemed to have been operative from June 1, 1956, provided that Parties shall have, from the date of signing, maintained under their internal the prohibition and effective prevention of pelagic sealing by all persons and ves subject to their respective jurisdictions.

4. The present Convention shall continue in force for six years and therea until the entry into force of a new or revised Fur Seal convention between the Par or until the expiration of one year after such period of six years, whichever may the earlier; provided, however, that it may continue in force for a further perio the Parties so decide at the meeting early in the sixth year provided for in Article

5. The original of this Convention shall be deposited with the Government of United States of America, which shall communicate certified copies thereof to of the Governments signatory to the Convention.

Schedule

1. The United States of America each year during the first four years shall 50,000 black pups on the Pribilof Islands.

2. The Union of Soviet Socialist Republics each year during the first four y shall tag 25 per cent of the black pups on the Commander Islands and 25 per ce the black pups on Robben Island.

3. In the event that pelagic sealing should be suspended for one or more y

under the provisions of Article IV, paragraph 3, the tagging of black pups shall continue at the mentioned rates for a comparable number of years.

4. The United States of America each year shall take at sea for research purposes in the Eastern Pacific Ocean between 1,250 and 1,750 seals.

5. Canada each year shall take at sea for research purposes in the Eastern Pacific Ocean between 500 and 750 seals.

6. Japan shall take at sea in the Western Pacific Ocean:

(*a*) annually in the first and second years of pelagic research between 2,750 and 3,250 seals;

(*b*) annually during the remaining four years of pelagic research between 1,400 and 1,600 seals.

7. The Union of Soviet Socialist Republics shall take at sea in the Western Pacific Ocean:

(*a*) annually in the first and second years of pelagic research between 750 and 1,250 seals;

(*b*) annually during the remaining four years of pelagic research between 400 and 600 seals.

TRANS-ARCTIC COMMERCIAL FLIGHTS, 1957

[From information provided by Pan American World Airways and Trans World Airlines.]

Two more commercial companies began regular trans-Arctic air services between Europe and the United States in 1957.

The inaugural flight of the Pan American World Airways service left San Francisco at 8 a.m. on 10 September and, flying over the North Pole, reached London after 17 hr. 10 min. flying time. The distance is about 5900 miles. A refuelling stop of 2 hr. was made at Frobisher Bay. The aircraft used was a Douglas DC 7 C. The company operates four services a week in each direction, with refuelling stops at Frobisher Bay. Flights from London are: Sundays to Los Angeles and San Francisco, Tuesdays to Seattle and San Francisco, Thursdays to Los Angeles and San Francisco. On Saturdays there is a flight from Paris to Los Angeles and San Francisco. Return flights from the United States leave on Mondays, Wednesdays and Saturdays for London, and on Fridays for Paris.

The inaugural flight of the Trans World Airlines service was made on 29–30 September, between Los Angeles and London. The distance of 4,890 miles was covered non-stop in 18 hr. 38 min. Later in the same week an aircraft made the flight in 16 hr. 24 min., though weather conditions over London prevented the landing being made for another 47 min. The first west-bound flight, from London to San Francisco, was made on 1–2 October in the non-stop time of 23 hr. 19 min. The aircraft used on this service are the Lockheed 1649A "Jetstream" which have non-stop range of 6300 miles. The route crosses the south of Greenland and Baffin Island. An emergency fuel stop has been provided at Frobisher Bay. The service consists of two flights a week in each direction: one from Los Angeles to London and one from Los Angeles to Paris and Rome; one from London, and one from Paris and Rome, to Los Angeles and San Francisco.

EXPLOITATION OF LEAD AND ZINC DEPOSITS AT MESTERS VIG, EAST GREENLAND

[Based on information in articles by Bertil Astlind (*Industria*, Årg. 52, Nr. 7–8, 1956, p. 2 25), Per Kampmann (*Danish Foreign Office Journal*, No. 16, 1955, p. 11–14, and *Grønlan* 1953, Hft. 2, p. 46–49), Jan Bondam, Edwin Winther and V. Brinch (*Grønland*, 195 Hft. 10, p. 386–92; Hft. 11, p. 414–24; and 1955, Nr. 2, p. 41–46), and in *Arctic Circul* Vol. 6, No. 1, 1953, p. 10, *Atuagagdliutit/Grønlandsposten*, 1955, Nr. 10, p. 16; Nr. 21, p. 1956, Nr. 3, p. 12; Nr. 7, p. 2; Nr. 12, p. 18; Nr. 15, p. 8; Nr. 22, p. 10, *Northern Min* Vol. 37, No. 28, 1951, p. 17, 21; No. 41, 1952, p. 6; No. 43, 1952, p. 39, 44, *Berlingske Tiden* 1 and 5 oktober 1957.]

In 1948 geologists belonging to Dr Lauge Koch's annual expedition to ea Greenland, and under the leadership of the Swiss geologist Dr Hans Taube discovered indications of lead deposits at Mesters Vig (approx. lat. 72° 15′ N long. 24° W.). Further surveys of the deposits were made in the summers 1949, 1950 and 1951, and a mountain, which was named "Blyklippen" [Lea rock], was found to show particular promise of rich veins of lead and zin In 1952 a company, Nordisk Mineselskab A/S, was formed to investigate th possibilities of profitable exploitation. The Danish state and Danish industr holds 55 per cent of the shares in the company, 30 per cent are held by th Swedish mining companies Boliden Gruvaktiebolag and Stora Kopparberg Bergslags Aktiebolag, and a Canadian company, Ventures Ltd., owns th remaining 15 per cent. The chairman is the Danish engineer and industriali Per Kampmann. The company obtained a concession of the area between th inland ice and the sea, between lats. 70° N. and 74° 30′ N.

In the summer of 1952 a systematic survey of "Blyklippen" and the su rounding area was begun. Near the site of the mine, 12 km. from the sea ar at a height of about 300 m., a mining village was built, consisting of insulate wooden houses, centrally heated by an oil-burning heating plant. In additio to living quarters and offices, a hospital, canteen, bath house, workshops, sto houses and a diesel power station were built. There are about twenty buildin altogether. A water works was constructed for pumping the large quantiti of water needed for mining operations from the neighbouring river. Ice kee Mesters Vig closed to shipping for all but 4 to 6 weeks of the year; it was ther fore necessary to establish all year round air communications in order maintain a permanent labour force. An airstrip was built, in less than 2 month 10 km. from the mining village and about 2 km. from the sea, on the pla formed by the delta of a river running out into Kong Oscars Fjord. It measur 1800 m. by 45 m. and runs from east to west, in the direction of the prevailin wind. It was used for the first time by an Icelandic Catalina on 8 Septemb 1952, and officially inaugurated by the S.A.S. DC 4 *Sigtrygg Viking* on the 26t Both permafrost and flooding of the river due to the summer thaw hav presented problems which have been successfully overcome. A radio statio and a weather station were also set up by the airstrip. A road was built co necting it to the landing place on Kong Oscars Fjord, the mining village ar the mine itself. A total labour force of 177 men was used on the vario projects during the construction period.

Investigations had been completed by 1954; over 2000 m. of adit had been driven into the rock at three different levels, nearly 100 diamond bore holes had been drilled, and 2000 ore samples had been analysed. It was estimated that lead and zinc to a total value of about 100,000,000 D.Kr. could be extracted over a period of 6 to 7 years, and at an economic cost. The lead and zinc occur in deposits of galena and sphalerite in a vein of quartz. The broken ore consists of 70 to 80 per cent non-metalliferous material and it is not economic to transport it in this state. The laboratory of Bolidens Gruvaktiebolag solved this problem by developing a method of obtaining high concentrates of galena and sphalerite on the spot, converting 12 per cent lead and 8 per cent zinc ores into 80 per cent lead and 60 per cent zinc concentrates. The severity of the climate (average winter temperature approx. −20° C., summer approx. +5° C.) and the permafrost made it necessary to put the flotation plant, used for the process, underground. Blasting operations commenced in February 1955 and took about six months.

In 1955 cargoes totalling 7000 tons were unloaded from 10 ships at Mesters Vig, and in August the installation of machinery began. In February 1956 the mine was ready to begin production. There are about 10 officials and 80 workers at the mine, mostly Danes. No women live at Mesters Vig. Miners work a 60– to 70–hour week. Work is carried on day and night, in shifts, from February to November. December and January, the darkest months, are also those in which the water supply problem becomes most acute on account of freezing, and only a few mechanics remain at Mesters Vig. Transport of the concentrates down to the landing place is limited to the period July to November, and they can usually only be shipped out in August and September. Transport is provided by the Danish Lauritzen Line ships.

Production started in the spring of 1956. During that year about 10,500 tons of lead and zinc concentrates were produced, and about 3,700 tons of lead concentrate and 4,900 tons of zinc concentrate were shipped, representing a sales value of some 8,250,000 D.Kr. In 1957, 8,750 tons of lead concentrate and 13,650 tons of zinc concentrate were shipped and sold for about 20,000,000 D.Kr. The chief markets are Belgium and the German Federal Republic.

LOSS OF *POLARBJØRN*, 1957

[Summarized from *Dagens Nyheter*, 26 August–1 September 1957.]

At the end of August 1957 the Norwegian sealer *Polarbjørn*, B. Brandal, master, became beset in the pack ice in Foster Bugt off north-east Greenland (approx. lat. 73° N., long. 20° W.). The port side was partly buckled and torn by the pressure of the ice. The vessel, which is owned by A/S Polarbjørn, Ålesund, was on charter to Norsk Polarinstitutt, and on its way home to Norway after carrying out the annual relief of Norwegian trapping stations and the Norwegian meteorological station at Myggbukta in east Greenland. The leader of the expedition was John Giæver. There were 23 men on board.

Three vessels were in the vicinity and maintained radio contact with

Polarbjørn when she became fast in the ice; they were the Norwegian seal *Jopeter*, which had been in a similar plight herself further up the same coa in 1955 (see *Polar Record*, Vol. 8, No. 53, 1956, p. 179–80, and Vol. 8, No. 5 1957, p. 456), and the Danish ships *Tora Dan* and *Kista Dan*. The thickness the ice prevented them, however, from coming to *Polarbjørn*'s assistanc On 25 August equipment and lifeboats were unloaded from *Polarbjørn* and on board abandoned the vessel and established themselves on the ice. It w feared that if the vessel became free again she would sink as a result of t damage suffered. *Polarbjørn* did in fact begin to take in water, but this froz and the vessel stopped leaking. After a night on the ice the crew therefo went aboard once more. On the evening of 28 August a United States A Force helicopter, which had been flown from Thule to the air strip at Meste Vig on the east coast in a heavy transport aircraft, began to evacuate the me four at a time. On the 30th the last three men, Giæver, Brandal and the chi engineer, were taken off the ice, after mist had caused some delay and anxiet On the 31st the men were flown to Iceland.

Polarbjørn, 292 gross reg. tons, was built in 1950 at Bolsønes Verft, Mold

NEW MAIL-SHIP FOR THE FALKLAND ISLANDS

[Summarized from *Shipbuilding and Shipping Record*, August 1957.]

The Falkland Islands Company have withdrawn *Fitzroy* (ex-*Lafonia*) fro the mail service between Montevideo and Port Stanley, Falkland Islands, a she is being broken up. In addition to some 30 years' service on this rout *Fitzroy* was chartered by Operation "Tabarin" and the Falkland Islan Dependencies Survey during the years 1944–48, and used for the establis ment and re-supply of bases in the Falkland Islands Dependencies.

She has been replaced by *Darwin*, built by the Goole Shipbuilding a Repairing Company at Goole, Yorkshire. Particulars of the new ship a length B.P. 220 ft.; breadth mld. 40 ft.; deadweight tonnage 1090 to service speed 10 knots. *Darwin* is propelled by steam triple expansi machinery, the engine developing 1150 h.p. at 125 r.p.m. Accommodati is provided for thirty-six passengers and a crew of thirty.

ARGENTINE LAW RELATING TO THE ANTARCTIC, 1957

[The texts of earlier Argentine laws were published in the *Polar Record*, Vol. 4, No. 1946, p. 412–17; Vol. 5, Nos. 35/36, 1948, p. 223–27; No. 39, 1950, p. 478–81; and Vol. No. 47, 1954, p. 80–82. By Decree-Law No. 2191 of 28 February 1957 (published in *Boletín Oficial* of 19 March 1957) the Argentine Government have re-established what called "The National Territory of Tierra del Fuego, the Antarctic and the islands of South Atlantic". A translation is given below of the articles which show that the Argent Government have extended the administrative arrangements for the new National Territ to the Falkland Islands and the Falkland Islands Dependencies, with effect from 1 March 195

Translation:

Argentine Decree-Law No. 2191 *of* 28 *February* 1957

"In view of decree-law No. 21,178/56 establishing new boundaries for ex-Province of Patagonia, now Santa Cruz, and considering: That it is nec

sary to adopt the measures requisite for the government of the territories which, in virtue of that act, have remained outside the boundaries of the provinces;

"The Provisional President of the Argentine Nation, in Exercise of the Legislative Power,

Decrees with the Force of Law:

First part—Preliminary Provisions

Chapter I. Establishment

1. Declaration

"*Article* 1—There shall be re-established the National Territory of Tierra del Fuego, the Antarctic and Islands of the South Atlantic, the organisation, government and administration of which shall be regulated by the provisions of the present decree-law.

2. Component territories

"*Article* 2—The National Territory of Tierra del Fuego, the Antarctic and Islands of the South Atlantic comprises: the eastern part of Isla Grande and other islands of the archipelago of Tierra del Fuego, Isla de los Estados and Isla Ano Nuevo, in accordance with the boundaries fixed by the Treaty of 23 July 1881, the Islas Malvinas [Falkland Islands], the Islands of South Georgia, the South Sandwich Islands and the Argentine Antarctic Sector contained within the meridians 25° West and 74° West and the parallel 60° South.

3. Juridical persons

"*Article* 3—The National Territory of Tierra del Fuego, the Antarctic and the Islands of the South Atlantic and its municipal corporations shall constitute public and private juridical persons of necessary existence.

4. Capital

"*Article* 4—The capital of the National Territory of Tierra del Fuego, the Antarctic and the Islands of the South Atlantic is declared to be the town of Ushuaia in which the local government and the principal federal offices shall have their seat.

Fourth part—Temporary Provision

1. Date of entry into force

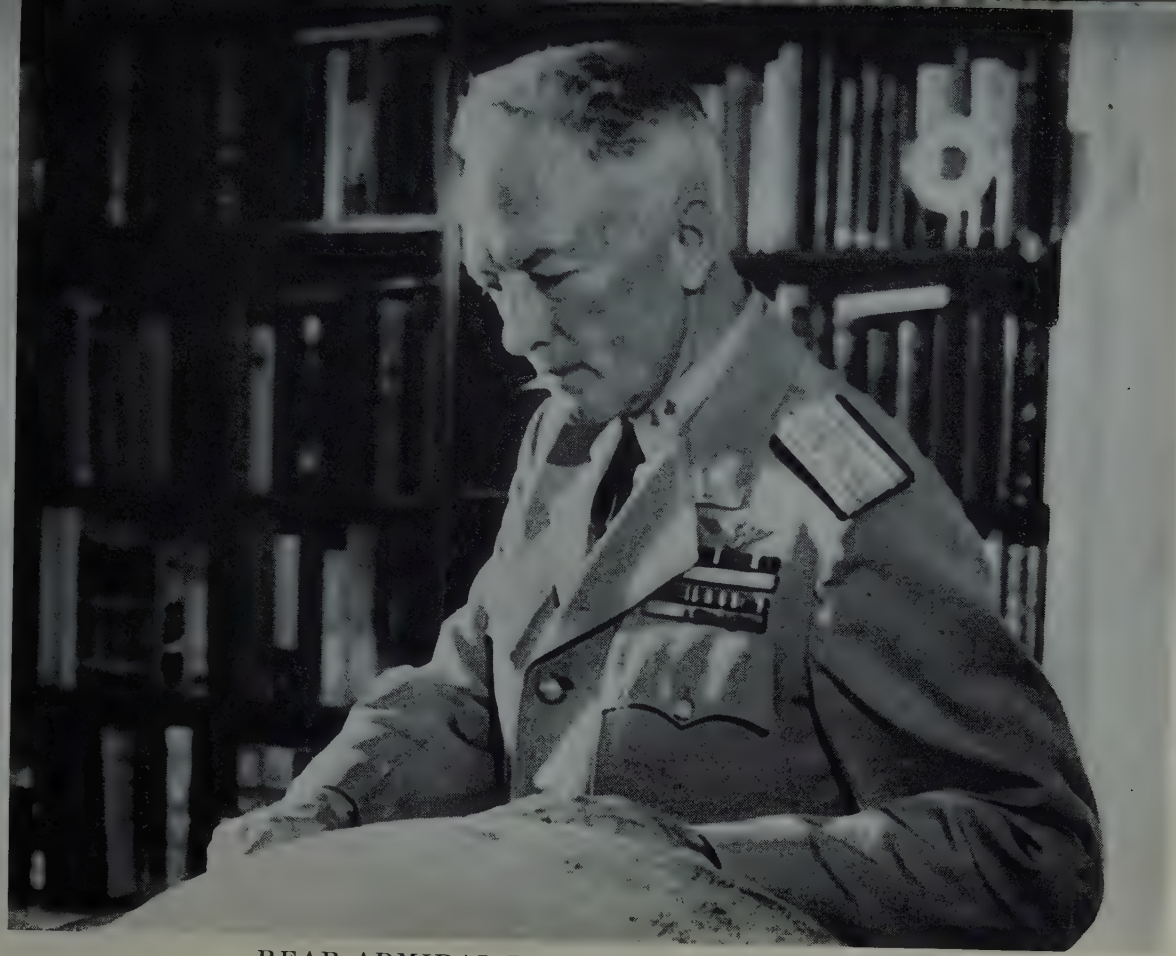
"*Article* 80—The present decree-law shall come into force on 1 March 1957 and until the governor of the Territory takes office the administration of the territory shall be the responsibility of the Federal Interventor in the Province of Santa Cruz."

OBITUARY

Rear-Admiral Richard Evelyn Byrd was born in Virginia on 25 October 18
and died in Boston, Massachusetts, on 11 March 1957. He received his commiss
in the United States Navy in 1912 but was compelled to retire, on account of an
leg injury, in 1916. He was recalled when the United States entered the First Wo
War and received training as a pilot. During the war he held staff appointments
Canada and in the United States.

In 1925 he commanded the Naval Flying Unit which accompanied the Macmil
expedition to west Greenland. The aircraft used were three Loening Amphibians a
a number of successful flights were made over Ellesmere Island and the Greenla
ice sheet. His next objective was the North Pole, and in 1926 he organized a priv
expedition to Kongsfjorden in Spitsbergen. It arrived there to find preparati
almost completed for the Amundsen–Ellsworth–Nobile expedition to the North Po
and the dirigible *Norge* on her way north to Kongsfjorden. The successful flight w
made by Byrd and Floyd Bennett in a Fokker three-engine monoplane on 9 M
1926. Byrd had, since 1918, been planning a flight across the Atlantic Ocean, bu
series of vicissitudes prevented this until 1927. With four companions he made t
third non-stop flight from the United States to Europe, crash landing in the sea
Ver-sur-Mer, France, on 29 June.

Byrd's already established reputation made it possible for him to contempl
larger ventures and, in 1928–30, he led a private expedition to the Ross Sea area
Antarctica. From his base at "Little America" in the Bay of Whales a series
exploratory flights were made. The Rockefeller Mountains, Edsel Ford Ranges a
Marie Byrd Land were discovered from the air, and part of the Queen Maud Ra
was mapped from both ground and air. On 29–30 November 1929 Byrd took p
in the first successful flight over the South Pole. In 1933–35 he led a second priv
expedition to the Bay of Whales. An extensive scientific and exploratory program
was carried out from an enlarged "Little America". The eastern margin of the R
Ice Shelf was charted during sledge journeys to the Edsel Ford Ranges, Rockefe
Plateau and Queen Maud Range. Geological parties visited the Queen Maud Ra
and the polar plateau. Seismic soundings were made on the Ross Ice Shelf and
Rockefeller Plateau. During the winter of 1934 he narrowly escaped death from
poisoning while manning an advance weather station alone, 100 miles south
"Little America". In 1939–41 he commanded the United States Antarctic Serv
Expedition, during which one party wintered at "Little America" and another
Neny Fjord in Marguerite Bay, Graham Land. Extensive explorations by air w
made from both bases, including three flights south over the Amundsen Sea.
portant sledge journeys were made in Graham Land towards King George
Sound and the south-western coast of the Weddell Sea; the earlier discoveries
Marie Byrd Land and the Ross Ice Shelf were greatly extended. A comprehens
scientific programme was carried out from both bases. Byrd returned to Antarc
in 1946–47 in command of the United States Navy Antarctic Expedition, Operat
"High Jump", the largest expedition to visit the continent. The twelve sh
divided into three groups, sailed round the whole continent carrying out an exten
programme of air reconnaissance and photography. The expedition did not wi
in Antarctica. In 1955 Byrd was appointed Officer-in-Charge of the United St
Antarctic Programs and held the appointment until his death. His last expedi
to Antarctica was as commander of the United States Navy Expedition "D
freeze I", 1955–56, in connexion with the United States programme for the In



REAR-ADMIRAL RICHARD E. BYRD, U.S.N.

(*Facing p. 54*)

national Geophysical Year. A new "Little America" was established in Kainan Bay, and enormous quantities of stores and equipment landed for use during the International Geophysical Year. A number of long-distance flights were made, including one to the Weddell Sea and back, non-stop.

Byrd was a man of many abilities, of infinite tenacity of purpose and notable qualities of leadership. Many leaders of United States enterprise in Antarctica received their training under him. For thirty years he was the outstanding figure in the Antarctic affairs of the United States. These thirty years witnessed a revolution in the techniques of transport and communication which Byrd was foremost in applying to the specialized needs of Antarctic exploration. A symbol of this initiative was the establishment, in 1956–57, of the United States South Pole station entirely from the air, during which over 1000 tons of stores and equipment were transported by aircraft from the base at McMurdo Sound. The position of the United States in Antarctic affairs today is in a great measure due to his work and inspiration.

Admiral Edward Ratcliffe Garth Russell Evans, R.N., retd., Lord Mountevans, was born in England on 28 October 1881 and died in Norway on 20 August 1957. He was educated at Merchant Taylors School and H.M.S. *Worcester*, then joined the Royal Navy in 1896. As a sub-lieutenant on the *Morning* he took part in the relief of Scott's *Discovery* expedition in 1902. In 1910 he joined the *Terra Nova* expedition as navigator and second-in-command. Frank Debenham writes of him:

"I first met Lieut. Evans as commander of the *Terra Nova* when she sailed from New Zealand with Captain Scott's last expedition and very soon noted his capacity for throwing aside the responsibility of such a post to lead or join in the fun and games which went on in the ward-room.

"Though still a young man he had already seen Antarctic service as one of two very junior officers in the *Morning*, the relief ship for Captain Scott's *Discovery* expedition 1902. He was by temperament well fitted for the sudden emergencies which must occur in the life of a ship's officer, especially in those stormy seas.

"Possibly he was not so much at home on land, where the dullness of sledging, of enduring long delays when blizzard-bound did not give much scope to his Welsh character. Nevertheless, he was in all the major journeys and was leader of the last supporting party to leave Captain Scott on the latter's fatal journey to the Pole. During that return trip his only companions were two of the men, Petty Officer Tom Crean and Chief Stoker Bill Lashly to whom he owed his life.

"Evans had to be invalided home to New Zealand in 1912 and he returned on the *Terra Nova* in January 1913 to take the command of the expedition, which thus devolved on him for the last few weeks."

In 1914 he returned to naval duty in command of a destroyer and was actively engaged in the Dover Patrol throughout the First World War. He gained special promotion and fame when, commanding *Broke* and together with *Swift*, he attacked six German destroyers returning from a raid on Dover. Later, when commanding the cruiser *Carlisle* on the China Station, he risked his life to rescue the crew of the wrecked steamer *Hong Moh* near Swatow. After appointments as Captain of the Fishery Protection and Minesweeping Flotilla, and the battle-cruiser *Repulse*, he was promoted rear-admiral in 1928. He commanded the Australia Squadron from 1929 to 1931 and the Africa Station in 1933 to 1935. In 1934, on the sloop *Milford*, he visited Bouvetøya. He relinquished the Nore Command in January 1939, and was immediately appointed a Regional Commissioner for London in the Civil Defence scheme. He was knighted in 1935, and made a peer in 1945.

Wilhelm Filchner died on 7 May 1957 in Switzerland, at the age of seventy-nin He led two expeditions to the polar regions. His expedition to Spitsbergen in 19 was undertaken to provide polar experience and to test equipment for his fort coming Antarctic expedition. His major contribution to polar exploration was t voyage to the Weddell Sea in 1911–12 when his intention was to cross Antarctic He was the first to reach the head of the Weddell Sea, discovering Vahsel Bay, b the section of the ice shelf on which he established his base camp broke free in storm and drifted out to sea. Everyone was rescued, but his ship *Deutschland* w then beset and drifted for nine months in the Weddell Sea before reaching ope water. The observations made during this period were very valuable, since the ar was completely unknown. His further antarctic plans had to be abandoned becau of the First World War. Filchner was also a notable explorer of central Asia and Tibe

Lorentz Peter Elfred Freuchen, the Danish arctic explorer, adventurer ar writer, was born on 20 February 1886 at Nykøbing in Denmark, and died on 2 Se temper 1957 at the airfield at Anchorage, Alaska, while on his way to make a film north-west Greenland and the polar basin.

Freuchen abandoned medical studies in order to take part in Mylius-Erichsen *Danmark* expedition to north-east Greenland, 1906–08, as meterological assista to Alfred Wegener. He first went to west Greenland as a stoker on the vessel whi collected sledge dogs for the expedition. In 1910 he helped Knud Rasmussen found the Eskimo settlement of Thule in north-west Greenland. There he married pure Eskimo, Navarana Mequpaluk, and successfully adapted himself to t Eskimo way of life. In 1912 Freuchen, Rasmussen and two Eskimos formed t First Thule Expedition, crossing the Greenland ice sheet to the north-east coa and back to Thule. It was Freuchen who first mapped the area around the head Independence Fjord, and demonstrated the correctness of Mylius-Erichsen's di covery in 1907 (then unknown) that Peary Channel did not exist. Freuchen spe the next six years, 1913–19, administering the settlement at Thule, as Handel bestyrer [Trading manager]. In 1919 he helped Godfred Hansen lay out depots north Greenland for the use of Amundsen's *Maud* expedition. In 1921 Navara died of influenza in west Greenland, when she and Freuchen were on their way take part in Rasmussen's Fifth Thule Expedition, 1921–24. Freuchen joined t expedition as cartographer and biologist, and it was then that he suffered the fros bite which later necessitated amputation of his left foot. For some years Freuch lived in Denmark engaged in farming, journalism and writing, including novels wi a polar background. In 1928 he travelled in the Soviet Arctic, and he revisited we Greenland in 1929 and 1930. In 1932–33 he made the film "Eskimo" in Alask himself playing one of the main parts. After travels in South America he visited t Soviet Arctic again in 1937, when he sailed from Tiksi to Vladivostok. In 1938 made an unsuccessful film in Lapland. Freuchen worked in the Danish undergrou movement during the German occupation, was arrested, and escaped to Sweden 1944. From there he went to the United States, where he lived most of the time aft the war.

He possessed an immense physique, great strength and a mind rich in fantas With Freuchen's death the Arctic has lost one of its most colourful characters.

Johannes Grøntved, the Danish botanist was born in 1882 and died in 19 He visited Iceland four times, and worked in Greenland in 1932, 1937 and 1953. the first occasion he was on Disko, and in the latter two years he studied the flora south Greenland. He published numerous papers on the botany of these t regions.

Just Knud Qvigstad, the Norwegian philologist and ethnographer, died in March 1957, a few days before his 104th birthday. After studying philology at Oslo University, Qvigstad went to Tromsø as a school-teacher in 1875, and spent most of the rest of his life there. In 1878 he learned Lappish. In the same year he took up a post at the Tromsø lærerseminarium [Teachers' training college] and in 1883 he became headmaster, a position he held, with only one short break, for thirty-seven years. Between 1905 and 1910 he was engaged as an expert during the dispute over reindeer between Norway and Sweden. Together with his Swedish colleague, K. B. Wiklund, he published *Dokumenter angaaende flytlapperne* [Documents concerning the nomadic Lapps] (Kristiania, Renbeitekommissionen af 1907, 1909). For the next two years Qvigstad was Kirkestatsråd [Minister for Church and Educational Affairs]. He retired in 1920 and began a rich period of scholarly activity, publishing a number of important works relating to Lapp culture. Qvigstad also took active part in humanitarian and religious work on behalf of the Lapps, translating books into Lappish and developing it as a literary language. He was a member of the board of Tromsø Museum from 1884 to 1934 and served as vice-chairman and chairman. He was in charge of the Lapp department of the museum until 1931.

Fredrik Carl Mülertz Størmer was born on 3 September 1874 at Skien, Norway, and died in Oslo on 13 August 1957. An eminent astro-physicist, he was professor of pure mathematics at Oslo University from 1903 to 1946. He made a special study of aurora and devised a method of determining the heights and positions of aurora by means of photography. The method entails simultaneous photographs being taken at two widely separated points, and was developed by him at Bossekop, in Finnmark, in 1910 and 1913. As chairman of two international committees Størmer helped to organize the observation and photographing of aurora in both Arctic and Antarctic during the Polar Year 1932–33. In 1951 he was made a foreign member of the Royal Society.

Harald Ulrik Sverdrup, the eminent Norwegian meteorologist and oceanographer, was born on 15 November 1888 in Sogndal, Norway, and died on 21 August 1957.

He was assistant to Professor Vilhelm Bjerknes, the Norwegian physicist, from 1911 to 1917. In this last year he gained his doctorate with an important thesis on the dynamic and thermodynamic structure of the North Atlantic trade winds. Sverdrup was appointed chief scientist of the Norwegian North Polar Expedition, 1918–25, in the *Maud*. In 1919–20, when the *Maud* was at Ostrov Ayon, he learned the language of the Chukchis and accompanied them for seven and a half months on their winter inland migration. His observations of these people were first published as part of Amundsen's *Nordostpassagen* (Kristiania, 1921) and later as *Hos tundrafolket* (Oslo, 1938). From January to April 1921, when the *Maud* was at Mys Serdtse-Kamen, Sverdrup and Wisting made a sledge journey round the coast of Chukotski Poluostrov to Zaliv Kresta. Sverdrup, Wisting and Olonkin were the only men—not excluding Amundsen himself—who were with the expedition throughout the seven years it lasted. He was the editor of the scientific reports of this expedition, and himself wrote thirteen of the forty contributions.

From 1926 to 1931 Sverdrup was Professor of Meteorology at Det Geofysiske Institutt in Bergen, and in 1926, and from 1928 to 1940, a Research Associate of the Carnegie Institution. In 1931 he was chief scientist of Sir Hubert Wilkins's Arctic expedition in the submarine *Nautilus*. From 1931 to 1936 Sverdrup held a research post in geophysics at Christian Michelsens Institutt for Videnskap og Åndsfrihet in Bergen. In 1934 he was joint leader with Hans Ahlmann of the Norwegian–Swedish

Expedition to north-west Spitsbergen, during which he studied the heat exchan between the atmosphere and a snow surface. In 1936 Sverdrup became Director the Scripps Institution of Oceanography of the University of California, at La Jol a position he held until 1948. At the same time he was Professor of Oceanography the University of California. At La Jolla he made studies of wind and currents whi were of great importance to fishery investigations. During the Second World W he worked on problems in connexion with submarines, and on warnings for sw which might occur during landing operations. In 1948 Sverdrup returned to Norw to become Director of Norsk Polarinstitutt. In 1949 he was in addition appoint to the chair of Geophysics at Oslo University, where he also held the chairs Mathematics and Natural Sciences. He was chairman of the international committ of the Norwegian–British–Swedish Antarctic Expedition, 1949–52, and much of t success of the organization of the expedition was due to his energy and influen In January 1951 he visited Maudheim on board *Norsel*.

In 1956 he became vice-chairman of Det akademiske kollegium (the chief a ministrative body of the university) and deputy rector. He was chairman of t Norwegian fund for assistance to underdeveloped countries, and visited India investigate the administration of Norwegian aid there. At the time of his death was engaged in the organization of the Norwegian International Geophysical Ye expedition to Antarctica, for which Norsk Polarinstitutt is responsible.

The number of Sverdrup's publications is large; a bibliography has been publish in the *Journal of Marine Research*, Vol. 7, No. 3, 1948, p. 127–38.

RECENT POLAR LITERATURE

This selected bibliography has been prepared by R. J. Adie, Terence Armstrong, T. H. Ellison, Amorey Gethin, J. W. Glen, W. B. Harland, H. G. R. King, Brian Roberts and Ann Savours. Its main field is the polar regions, but it also includes other related subjects such as "applied" glaciology (e.g. snow ploughs and ice engineering). For the literature on the scientific study of snow and ice and of their effects on the earth, readers should consult the bibliographies in each issue of the *Journal of Glaciology*. For Russian material, the system of transliteration used is that agreed by the U.S. Board on Geographic Names and the Permanent Committee on Geographical Names for British Official Use in 1947 (see *Polar Record*, Vol. 6, No. 44, 1952, p. 546).

Reprints of "Recent Polar Literature", from Nos. 37/38 onwards, can be obtained separately (to allow references to be cut out for pasting on index cards) from the Institute, price 2*s*. 6*d*. for two reprints. Copies will be sent without charge to organizations with which the Institute maintains exchange arrangements and which notify their wish to receive them. Readers can greatly assist by sending copies of their publications to the library of the Institute.

To increase the usefulness of the bibliography entries have been arranged provisionally under subject headings in classified order according to the Universal Decimal Classification. When circumstances permit the decimal notation will be included, together with a key.

INSTITUTIONS

[North Atlantic Ice Patrol] *Agreement regarding the financial support of the North Atlantic Ice Patrol. Washington, January 4, 1956*. London, Her Majesty's Stationery Office [1956]. 7 p. map. 24 cm. (Cmd. 9864.)

[Instituto Antártico Argentino] Instituto Antártico Argentino; nuevas autoridades. *Argentina Austral*, Año 28, No. 304, 1957, p. 37. [Names of staff of reorganized Argentine antarctic institute.]

Tremaine, Marie. The Arctic Institute of North America and its bibliography project. *Geography and Map Division, Special Libraries Association, Bulletin*, No. 18, 1954, p. 6–12. [Background to the *Arctic Bibliography*, started 1947.]

Andersen, Einar. Geodætisk Institut 1928–1955. *Geografisk Tidsskrift*, Bd. 55, 1956, p. 1–20, illus. [Work of Danish Geodetic Institute, 1928–55, including survey of Greenland. In Danish and French.]

Møller, E. Schelde. Grønlands Hus. *Grønland*, 1957, Nr. 1, p. 34–39. [Suggestion for centre for Greenland affairs in Copenhagen, to be called Grønlands Hus.]

Sternberg, Hans-Günther. Das Norwegische Polarinstitut und die norwegische Polarforschung nach dem Kriege. *Die Erde*, 1956, Heft 3–4, p. 290–96, map. [Norsk Polarinstitutt and its work since second world war.]

Östman, C. J. Naturvetenskaplig forskning vid fyra institutioner i övre Norrland. *Norrländsk Tidskrift*, Årg. 3, Nr. 2, 1954, p. 27–29, illus. [Four scientific institutions in north Sweden under common name Kungl. Vetenskapsakademiens forskningsstationer i Övre Norrland: Abisko naturvetenskapliga station; Kiruna geofysiska observatorium; Sareks naturvetenskapliga anläggningar; Tarfaladalens glaciologiska observatorium.]

Sweden: Official Organizations] Kiruna geofysiska observatorium. *Statens Naturvetenskapliga Forskningsråds Årsbok* (Stockholm), Årg. 9, 1955 (pub. 1956), p. 339–41. [Development of geophysical observatory at Kiruna, north Sweden.]

United States: Official Organizations] Proposed Antarctic Commission. *Congressional Record* (Senate), Vol. 103, No. 87, 1957, p. 6692. [Senator Wiley's proposal to introduce bill establishing Byrd Antarctic Commission.]

Zamshilov, M. M. Murmanskaya Biologicheskaya Stantsiya [Murman Biological Station]. *Priroda* [*Nature*], 1957, No. 3, p. 59–63, illus. [History and present activities.]

ETHNOGRAPHY. CUSTOMS. FOLKLORE

Knudsen, Erik Hjortenberg. Et besøg på en grønlandsk boplads. *Grønland*, 1956, Nr. 6, p. 235–39, illus. [Conditions at Qennertuarssivit settlement, near Angmagssalik, east Greenland.]

Malaurie, Jean. Perspectives offertes par l'évolution économique et sociale récente des Eskimos de Thulé. *Bulletin Internationale des Sciences Sociales*, Vol. 6, No. 3, 1954, p. 513–19. [Effect of establishment of American base on indigenous Eskimo.]

GRENIER, FERNAND. Essai d'adaptation des Esquimaux à la vie sédentaire dans l'île Baffin. *Cahiers de Géographie de Québec*, Nouvelle série, No. 1, 1956, p. 86–87. [Pe manently settled Eskimo population at Frobisher Bay since 1955.]

HAMELIN, LOUIS-EDMOND. Genre de vie à l'île de Southampton d'après le journal d'u Esquimau. *Cahiers de Géographie de Québec*, Nouvelle série, No. 1, 1956, p. 49–5 map. [Analysis of Eskimo's diary of 1926–27, to give general picture of life on Southam ton Island.]

CHARD, CHESTER S. The southwestern frontier of Eskimo culture. *American Antiquit* Vol. 22, No. 3, 1957, p. 304–05, illus. [English summary of paper by A. P. Okladniko and V. V. Naryshkin in *Sovetskaya Etnografiya*, 1955, No. 1, p. 151–58.]

HONIGMANN, JOHN J. The Attawapiskat Swampy Cree: an ethnographic reconstructio *Anthropological Papers of the University of Alaska*, Vol. 5, No. 1, 1956, p. 23–8 [Culture study of Cree Indians west of James Bay and southwest of Hudson Bay befo contact with Europeans.]

WHITAKER, IAN. Declining transhumance as an index of culture-change. *Studia Ethn graphica Upsaliensia*, 11, Arctica, p. 96–104. [Decreasing nomadism of Lapps.]

MADSÉN, LARS. *Helikopterresan. Ett reportage från fjällvärldens väglösa bebyggelse*, Stoc holm, LTs Förlag, 1955. 263 p. illus., maps. 21½ cm. 16·50 *Sw.Kr.* [Isolated cor munities in Swedish Lapland, visited in helicopter by author, 1954.]

ARTHAUD, JACQUES. *Derniers nomades du grand nord. Photographies de Anne et Jacqu Arthaud. Récit de Jacques Arthaud. Préface de Roger Frison-Roche.* Paris, Arthau 1956. 140 p. illus., maps (on end-papers). 24 cm. [Photographs and narrative author's life with Kautokeino Lapps of Norway during spring migration.]

STEEN, ADOLF. Kautokeinostudier. *Samiske Samlinger*, Bd. 3, 1956, 113 p. maps. [Hi torical account of nomadic Lapps of Kautokeino district, north Norway, since *c.* 155 emphasis on family history and relationships.]

DOLGIKH, B. O. Tamgi nganasanov i entsev [Marks of the Nganasany and Entsy]. *Akad miya Nauk SSSR. Institut Etnografii. Kratkiye Soobshcheniya* [*Academy of Sciences the U.S.S.R. Institute of Ethnography. Short Communications*], No. 27, 1957, p. 20–3 illus. [Marks for branding reindeer, also used as signatures.]

LEVIN, M. G., *and* POTAPOV, L. P., *eds. Narody Sibiri* [*Peoples of Siberia*]. Moscow, Leni grad, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Scienc of the U.S.S.R.], 1956. 1084 p. illus., maps. 26½ cm. [Material culture and soci structure of minority peoples in Siberia and Soviet Far East. Bibliography.]

PHILOLOGY. LINGUISTICS

MIKUSHEV, A. K. Tvorcheskiy put' S. Popova [Creative path of S. Popov]. *Akademiya Na SSSR. Komi Filial. Istoriko-Filologicheskiy Sbornik* [*Academy of Sciences of the U.S.S. Komi Branch. Historical and Philological Handbook*], Vypusk 3, 1956, p. 87–9 [Descriptive essay, with examples, of work of contemporary Komi poet.]

PODOROVA, A. I. Chastitsy v Komi yazyke [Particles in the Komi language]. *Akademi Nauk SSSR. Komi Filial. Istoriko-Filologicheskiy Sbornik* [*Academy of Sciences of t U.S.S.R. Komi Branch. Historical and Philological Handbook*], Vypusk 3, 1956, p. 119–3

SAKHAROVA, M. A. K voprosu o substantivizatsii imen prilagatel'nykh i ad"yektivizat imen sushchestvitel'nykh [Making substantives out of adjectives and making adjectiv out of substantives]. *Akademiya Nauk SSSR. Komi Filial. Istoriko-Filologichesk Sbornik* [*Academy of Sciences of the U.S.S.R. Komi Branch, Historical and Philologi Handbook*], Vypusk 3, 1956, p. 70–78. [Komi grammar.]

SEREBRENNIKOV, B. A. Iz istorii obrazovaniya glagol'nykh vremen v Komi yazyke [Histo of the formation of verbal tenses in the Komi language]. *Akademiya Nauk SSSR. Ko Filial. Istoriko-Filologicheskiy Sbornik* [*Academy of Sciences of the U.S.S.R. Ko Branch. Historical and Philological Handbook*], Vypusk 3, 1956, p. 57–69.

GEODESY. SURVEYING

CHANTELOU, JENS-FREDERIK. The rational surveying of Greenland. *In*: BURE, Kristja *ed. Greenland. 3rd ed.* [Copenhagen], Royal Danish Ministry for Foreign Affai [1956?], p. 153–60, illus. [Survey work by Danish Geodætisk Institut since 1927.]

HELK, J. V. The Danish topographical survey of Greenland. *Chartered Surveyor* (Londo Vol. 89, No. 8, 1957, p. 438–44, illus., map. [Work of Geodætisk Institut since 192

SUAREZ, JOSÉ M. *Actividades hidrográficas de la Armada Argentina en el Sector Antárti Argentino.* República Argentina, Ministerio de Marina, Dirección General de Nav gación e Hidrografía, 1955. [ii, 14] p. maps. 27 cm. [Aims and methods of hydrograph survey by Argentine navy in Falkland Islands Dependencies. Includes map of triang lation in Gerlache Strait area.]

VIL'NER, B., *and* SELIVANOV, M. Girokompas v arktike [Gyro-compass in the Arctic]. *Morskoy Flot* [*Merchant Fleet*], 1957, No. 6, p. 24. [Recent Soviet experience with ships' gyro-compasses.]

BISHOP, J. M. A second look at aerial surveys in Ontario. *Canadian Geographical Journal*, Vol. 54, No. 2, 1957, p. 78–89, map, illus. [Methods used in aerial survey work carried out by or for Ontario Department of Lands and Forests since 1946.]

PATERSON, W. S. B., *and* SLESSER, C. G. M. Trigonometrical levelling across the inland ice in north Greenland. *Empire Survey Review*, Vol. 13, No. 100, 1956, p. 252–61, illus., map. [1952–54. Discussion of methods.]

NAVIGATION. NAUTICAL ASTRONOMY

ANDERSON, E. W. Navigation in polar regions. *Journal of the Institute of Navigation*, Vol. 10, No. 2, 1957, p. 156–61, maps. [Problems explained.]

PEDERSEN, E. *Problèmes de navigation polaire*. Bruxelles, Office de Publicité, S.A., 1956. [81] p. illus., maps. 29 cm. (Centre Belge de Navigation, No. 16.) [Problems of polar navigation based on Scandinavian Airline System reports.]

GEOPHYSICS

KUZ'MIN, A. I., *and others*. Unikal'naya vspyshka intensivnosti kosmicheskikh luchey [A unique flash of intensity of cosmic rays], [by] R. I. Kuz'min, G. V. Skrypin, G. V. Tyanutova [and] Yu. G. Shafer. *Doklady Akademii Nauk SSSR* [*Reports of the Academy of Sciences of the U.S.S.R.*], Tom 108, No. 1, 1956, p. 66–68, illus. [Observations from Yakutsk.]

SOBERMAN, ROBERT K. High-altitude cosmic-ray neutron intensity variations. *Physical Review*, Ser. 2, Vol. 102, No. 5, 1956, p. 1399–409, illus. [Includes results of balloon flights from 88·6° geomagnetic lat. N. previously reported in *ibid.*, Vol. 97, 1955, p. 1276.]

TRYGGVASON, EYSTEINN. Jarðskjálftar árin 1954 og 1955. *Náttúrufræðingurinn*, Árg. 26, Hefti 2, 1956, p. 77–86, maps. [Earthquakes in Iceland in 1954–55. English summary.]

HOPE, E. R. Linear secular oscillation of the northern magnetic pole. *Journal of Geophysical Research*, Vol. 62, No. 1, 1957, p. 19–27, maps. [W. van Bemmelen's thesis of 1899 apparently supported by modern data.]

MAJOR, G. Hourly measurements of ionospheric characteristics. Macquarie Island, 1952. *Australian National Antarctic Research Expeditions Interim Reports*, 9, 1956, [124] p. tables.

LITTLE, A. S. Hourly measurements of ionospheric characteristics, Macquarie Island, 1953. *Australian National Antarctic Research Expeditions Interim Reports*, 10, 1956, [158] p. tables.

FIRMSTONE, T. F. Hourly measurements of ionospheric characteristics. Macquarie Island, 1954. *Australian National Antarctic Research Expeditions Interim Reports*, 12, 1955, [66] p. tables.

CALLOW, D. R. L. Hourly measurements of ionospheric characteristics, Macquarie Island, 1955. *Australian National Antarctic Research Expeditions Interim Reports*, 13, 1956, [54] p. tables.

O'MALLEY, THOMAS M. Airborne magnetometer maps Canada's northwest: over 100,000 square miles explored from the air. *Canadian Oil and Gas Industries*, Vol. 6, No. 3, 1953, p. 42–46, illus. [Used for aeromagnetic studies since 1947 in geologically unmapped areas.]

INGALL, L. N. Magnetic observations at Heard Island, 1952. *Australian National Antarctic Research Expeditions*. Series C, Vol. 1, Terrestrial Magnetism, 1956. [68] p. illus., map, tables.

BROOKS, J. A. Magnetic results from Heard Island, 1953. *Australia. Department of National Development, Bureau of Mineral Resources, Geology and Geophysics Report*, No. 30, 1956, [60] p. illus., map, tables.

MCGREGOR, P. M. Magnetic observations at Macquarie Island, 1952. *Australian National Antarctic Research Expeditions. Reports*, Series C, Vol. 1, Terrestrial Magnetism, 1956, [38] p. illus., tables.

TENNI, P. B., *and* BROOKS, J. A. Magnetic results from Macquarie Island, 1953. *Australia. Department of National Development, Bureau of Mineral Resources, Geology and Geophysics Report*, No. 31, 1956, [64] p. illus., maps, tables.

GENERAL GEOLOGY

(See also Stratigraphy, Petrology, Economic Geology)

COWIE, JOHN WATSON, *and* ADAMS, P. J. The geology of the Cambro-Ordovician rocks c central east Greenland. Part I. Stratigraphy and structure. *Meddelelser om Grønlan* Bd. 153, Nr. 1, 1957, 193 p. illus., maps. [Kong Christian den Xs Land; based on fiel work in years 1950–54.]

FRÄNKL, ERDHART. Some general remarks on the Caledonian mountain chain of eas Greenland. *Meddelelser om Grønland*, Bd. 103, Nr. 11, 1956, 43 p. illus., map. [Centra east and north-east Greenland. Stratigraphy and tectonics.]

HALLER, JOHN. Geologie der Nunatakker Region von Zentral-Ostgrønland zwischen 72° 3 und 74° 10′ N. Br. *Meddelelser om Grønland*, Bd. 154, Nr. 1, 1956, 172 p. illus., map [Geology of nunatak region of east Greenland between 72° 30′ and 74° 10′ N., based o field work in 1949–54. English summary.]

PEACOCK, J. D. The geology of Dronning Louise Land, N.E. Greenland. *Meddelels om Grønland*, Bd. 137, Nr. 7, 1956, 38 p. illus., maps. [Based on field work in 1952 54.]

WENK, EDUARD. Alpines und ostgrönländisch-kaledonisches kristallin, ein tektonisch petrogenetischer Vergleich. *Verhandlungen der Naturforschenden Gesellschaft in Base* Bd. 67, Nr. 2, 1956, p. 75–102, illus., maps. [Tectonic-petrogenetic comparison cristalline of east Greenland Caledonian zone and of Swiss Alps.]

FORTIER, Y. O., *and* MORLEY, L. W. Geological unity of the arctic islands. *Transactions the Royal Society of Canada*, Vol. 50, Series 3, 1956, p. 3–12, maps. [Working hypothes of origin of Canadian Arctic archipelago.]

MOFFIT, FRED H. Geology of the eastern part of the Alaska Range and adjacent area: summary of geological knowledge of the region, gained in more than forty years exploration and investigation. *United States Geological Survey Bulletin* 989-D, 195 v, p. 63–218, illus., maps (some folding at end). [Detailed description of geograph stratigraphy, structural geology and geological history of area. Placer and lode miner deposits are referred to specifically. Bibliography.]

MOFFIT, FRED H. Geology of the Prince William Sound region, Alaska: description of th geology of the region with discussion of typical mineral deposits of geologic interes *United States Geological Survey Bulletin* 989-E, 1954, iv, p. 225–310, illus., maps (o folding at end). [Detailed description of stratigraphy and mineral resources, wi special reference to copper and gold deposits.]

PLAFKER, GEORGE. Geologic investigations of proposed power sites at Cooper, Gran Ptarmigan and Crescent Lakes, Alaska. *United States Geological Survey Bullet* 1031-A, 1955, iv, 23 p. map (in end pocket). [Geological investigations on propos tunnel and dam sites in connection with plans for development of hydroelectr power.]

LAZ'KO, YEVGENIY MIKHAYLOVICH. *Geologicheskoye stroyeniye zapadnoy chasti Aldansko kristallicheskogo massiva* [*Geological structure of the western part of the Aldan crystalli massif*]. L'vov, Izdatel'stvo L'vovskogo Universiteta [Publishing House of L'v University], 1956. 198 p. illus., map. 27 cm. [Area of upper reaches of Aldan. Bas on author's field work, 1943–45 and 1951–54.]

SVYATLOVSKIY, A. YE. Yuzhno-Bystrinskiy khrebet na Kamchatke [Yuzhno-Bystrinsk Khrebet in Kamchatka]. *Trudy Laboratorii Vulkanologii* [*Transactions of the Laborato of Vulcanology*], Vyp. 12, 1956, p. 110–90, illus. [Geology, petrography and tectonics this mountain ridge.]

SVYATLOVSKIY, A. YE. Istoriya noveyshego vulkanizma i obrazovaniya rel'yefa v rayo vulkana Bakenin [History of the recent vulcanism and formation of relief in the regi of Vulkan Bakenin]. *Trudy Laboratorii Vulkanologii* [*Transactions of the Laboratory Vulcanology*], Vyp. 12, 1956, p. 53–109, illus. [Volcano in Kamchatka.]

HUGHES, C. J. Geological investigations in east Greenland. Part VI. A differentiated ba sill enclosed in the skærgaard intrusion, east Greenland and related sills injecting t lavas. *Meddelelser om Grønland*, Bd. 137, Nr. 2, 1956, 28 p. illus., maps. [Petrolog Kong Christian den IXs Land.]

IVANOV, V. V. Gidrotermy ochagov sovremennogo vulkanizma Kamchatki i Kuril'ski ostrovov [Hydrothermal centres of contemporary vulcanism in Kamchatka a Ostrova Kuril'skiye]. *Trudy Laboratorii Vulkanologii* [*Transactions of the Laboratory Vulcanology*], Vyp. 12, 1956, p. 197–217, illus. [Chemical analysis of gases in hot sprin and fumaroles.]

[CANADA : MUSKEG] Proceedings of the eastern muskeg research meeting, February 1956. *Canada. National Research Council. Associate Committee on Soil and Sn Mechanics. Technical Memorandum* No. 42, 1956. [78] p. illus., map.

RADFORTH, NORMAN W. Muskeg access, with special reference to problems of the petroleum industry. *Canada. National Research Council. Associate Committee on Soil and Snow Mechanics. Technical Memorandum* No. 43, 1956, 7 p. illus. (Reprint.) [Character, classification, air interpretation of muskeg.]

CARSOLA, ALFRED J. Recent marine sediments from Alaskan and northwest Canadian Arctic. *Bulletin of the American Association of Petroleum Geologists*, Vol. 38, No. 7, 1954, maps. [Analysis of bottom samples collected by U.S. Navy expeditions to Beaufort and Chukchi seas, 1950–51.]

HOUGH, JACK L. Sediment distribution in the southern oceans around Antarctica. *Journal of Sedimentary Petrology*, Vol. 26, No. 4, 1956, p. 301–06, map (folding facing p. 302). [Data for submarine deposits plotted from over 500 stations, pre-1947, plus information from U.S. Antarctic Expedition, 1946–47.]

GLACIOLOGY

HEUSSER, CALVIN J. Postglacial environments in the Canadian Rocky Mountains. *Ecological Monographs* 26, 1956, p. 263–302, map, illus. [Description of 12 living glaciers in Canadian Rocky Mountains and of glaciated country and meteorological record after retreat of Wisconsin ice.]

[METHODS OF EXCAVATING IN SNOW AND ICE] Instruments and methods: ice drills and corers. *Journal of Glaciology*, Vol. 3, No. 21, 1957, p. 30, illus. [Details of ice drilling and coring tools designed by the Snow, Ice and Permafrost Research Establishment.]

SHARP, ROBERT P. Glaciers in the Arctic. *Arctic*, Vol. 9, Nos. 1–2, 1956, p. 78–117, illus., maps (2 folding facing p. 80 and 82). [Size, nature and distribution.]

MELLOR, MALCOLM. Glacier observations in north-west Spitsbergen. *Journal of Glaciology*, Vol. 3, No. 21, 1957, p. 61–66, plate on p. 53, illus., map. [Measurements of accumulation on Isachsenfonna, of glacier flow on Blomstrandbreen and Kongsbreen, and of advance and retreat of these two glaciers and neighbouring glaciers.]

BESKOW, GUNNAR. Den levande isen. *På Skidor*, 1957 (pub. 1956), p. 5–17, illus. [Popular explanation of glaciers, illustrated by nine photographs of Okstindane, Nordland, north Norway.]

SHUMSKIY, P. A. Issledovaniye lednikovogo pokrova Antarktidy [Investigation of the ice cover of Antarctica]. *Priroda* [*Nature*], 1957, No. 7, p. 84–87. [Brief results of Soviet glaciological journey inland from Mirnyy in early 1957.]

SHUMSKIY, P. A. Glaciological and geomorphological reconnaissance in the Antarctic in 1956. *Journal of Glaciology*, Vol. 3, No. 21, 1957, p. 54–61, illus. [Report on ice regime and ice free areas in Kaiser Wilhelm II land and Queen Mary Land.]

CAILLEUX, ANDRÉ. L'inlandsis groenlandais, par André de Cayeux. *Géographia*, No. 40, 1955, p. 28–32, illus., maps. [Extent of present knowledge and past scientific exploration of Greenland ice sheet.]

BULL, COLIN B. B. Observations in north Greenland relating to theories of the properties of ice. *Journal of Glaciology*, Vol. 3, No. 21, 1957, p. 67–72. [Comparison between measured slope and thickness and Nye's theory of flow of ice sheets.]

MULLER, E. H., *and* COULTER, HENRY W. Incipient glacier development within Katmai caldera, Alaska. *Journal of Glaciology*, Vol. 3, No. 21, 1957, p. 13–17, illus., map. [Report of small glaciers forming in this volcanic caldera in south-west Alaska.]

LEBEDEV, A. A. Kak obrazuyetsya led v more [How ice forms at sea]. *Geografiya v Shkole* [*Geography in School*], 1957, No. 2, p. 55–56, illus. [Contains Russian ice terms.]

NUSSER, FRANZ. Eine neue internationale Eisnomenklatur. *Deutsche Hydrographische Zeitschrift*, Jahrg. 9, Heft 4, 1956, p. 174–82. [German version of World Meteorological Organization's ice nomenclature.]

KUYANTSEV, P. Ispol'zovaniye RLS "Neptun" pri plavanii vo l'dakh [Use of the "Neptun" radar set when navigating in ice]. *Morskoy Flot* [*Merchant Fleet*], 1957, No. 4, p. 23. [Performance of Soviet-made radar in recording presence of floating ice at sea.]

SAVCHENKOVA, YE. I. Ispol'zovaniye indeksa atmosfernoy tsirkulyatsii dlya razrabotki dolgosrochnogo prognoza srokov vskrytiya rek [Use of the index of atmospheric circulation for working out long-term forecasts of break-up of river ice]. *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], 1957, No. 5, p. 34–37. [Correlation between dates of break-up of river ice in north-western U.S.S.R. and type of air circulation in North Atlantic area.]

[BALTIC : SEA ICE] *Atlas der Eisverhältnisse der Deutschen Bucht und westlichen Ostsee.* Hamburg, Deutsches Hydrographisches Institut, 1956. [42] leaves, maps, tables. 29 × 40 cm. (Nr. 2334.) [Charts showing averages and extremes in floating ice distribution, with supporting data.]

Crary, Albert P. Arctic ice island research. *Advances in Geophysics* (New York), Vol. 1956, 41 p. illus., maps. (Reprint.) [Results of glaciological studies of T-3; results oceanographic and other observations.]

Crary, Albert P., *and others*. Evidence of climatic change from ice island studies, by A. Crary, J. Laurence Kulp and E. W. Marshall. *Science*, Vol. 122, No. 3181, 1955, p. 117 73, illus. [Analysis of horizontal dirt layers in cores collected 1952–54 from T-3.]

Ives, J. D. Geomorphological and glaciological investigations in the Torngat Mountains northern Labrador. *Arctic*, Vol. 9, No. 3, 1956, p. 213–14. [Outline of work on glac geology in 1956.]

Markgren, Martin. Glaciation och landskap i norra Fennoskandia. *Svensk Geografi Årsbok*, Årg. 32, 1956, p. 7–43, illus., map. [Landscape in northern Scandinavia duri and after Pleistocene glaciation, as indicated by glacial erosion and deposition. Engli summary.]

Auer, Väinö. The Pleistocene of Fuego-Patagonia. Part 1: the ice and interglacial ag *Annales Academiae Scientiarum Fennicae*, Series A III, 45, 1956, 227 p. illus., map [Full study of the glacial and glacial-geological features of Tierra del Fuego a Patagonia.]

Ives, J. D. Till patterns in central Labrador. *Canadian Geographer*, No. 8, 1956, p. 25–3 illus., maps. [Detailed examination of small scale pattern of glacial deposits in ar 45 miles south-east of Knob Lake.]

Schytt, Valter. Lateral drainage channels along the northern side of the Moltke Glaci north-west Greenland. *Geografiska Annaler*, Årg. 38, Häfte 1, 1956, p. 64–77, illu map.

Thompson, Hugh R. The old moraines of Pangnirtung Pass, Baffin Island. *Journal Glaciology*, Vol. 3, No. 21, 1957, p. 42–49, illus., map. [Discussion of origin and date moraines.]

FROST ACTION ON ROCKS AND SOIL. PERMAFROST

Meyster, L. A. O vzaimosvyazi teorii i praktiki v razvitii geokriologii [Interrelationsh of theory and practice in the development of geocryology]. *Materialy k Osnovam Uc niya o Merzlykh Zonakh Zemnoy Kory* [*Materials on the Principles of Study of the Froz Zones of the Earth's Crust*], Moscow, Vypusk 3, 1956, p. 5–17. [Relation betwe theoretical and practical studies in Soviet permafrost study since about 1927.]

Brown, Roger J. E. Permafrost investigations in the Mackenzie Delta. *Canadian G grapher*, No. 7, 1956, p. 21–26, illus. [Investigation of conditions at old Aklavik si 1953–54.]

Potzger, J. E., *and* Courtemanche, Albert. Permafrost and some characteristics of bo and vegetation of northern Quebec. *Revue Canadienne de Géographie*, Vol. 9, Nos. 2- 1955, p. 109–14, illus., map. [Lists bogs where permafrost found and gives depth upper frozen layer. General remarks on plant distribution. July, 1954.]

[Frost Action and Frozen Ground : Terminology] Frost and permafrost definitio In: *Factors related to frost action in soils*. Washington, D.C., Highway Research Boa 1955, p. 107–10. (Bulletin 111.) [List of terms prepared by Highway Research Boa Committee on frost heave and frost action in soil.]

[Frozen Ground : Methods and Equipment for Investigating] *Design and operati of an hydraulic analog computer for studies of freezing and thawing of soils, by Mass chusetts Institute of Technology, Department of Civil and Sanitary Engineering, S Engineering Division*. Boston, Mass., Arctic Construction and Frost Effects Laborato Corps of Engineers, U.S. Army, New England Division, 1956. [49] p. 16 plates. 28 c (Contract No. DZ-19-016-eng-2743.) [Apparatus gives depth of freezing or thawi under given soil and temperature conditions.]

Molfino, Ruben H. Ensayo edafológico sobre la Antártida Argentina. *República Arg tina. Ministerio de Agricultura y Ganadería. Dirección General de Investigacio Agrícolas. Instituto de Suelos y Agrotécnia*. Publicación No. 51, 1956, 49 p. illus., ma [Analysis of soil samples from South Shetland Islands. Observations on frost acti on superficial deposits.]

Cook, Frank A. Additional notes on mud circles at Resolute Bay, Northwest Territori *Canadian Geographer*, No. 8, 1956, p. 9–17, illus. [Patterned ground study, 1953– Quantitative findings and qualitative observations on 50 mud circles.]

Washburn, A. Lincoln. Unusual patterned ground in Greenland. *Bulletin of the G logical Society of America*, Vol. 67, 1956, p. 807–10, illus. [Field observations in Th area, north-west Greenland, 1954.]

Fraser, J. Keith. Physiographic notes on features in the Mackenzie Delta area. *Canad Geographer*, No. 8, 1956, p. 18–23, illus. [Examination of pingo-like features.]

PIHLAINEN, J. A., *and others*. Pingo in the Mackenzie Delta, Northwest Territories, Canada, by J. A. Pihlainen, R. J. E. Brown and R. F. Legget. *Bulletin of the Geological Society of America*, Vol. 67, 1956, p. 1119–22, illus. [Survey of pingo and two satellites, 1954.]

STAGER, J. K. Progress report on the analysis of the characteristics and distribution of pingos east of the Mackenzie Delta. *Canadian Geographer*, No. 7, 1956, p. 13–20, illus. [Characteristics of 1380 pingos located.]

OCEANOGRAPHY. HYDROGRAPHY. HYDROLOGY

MAKSIMOV, I. V. "Polyusnyy priliv" v okeane zemli [The "polar tide" in the earth's ocean]. *Doklady Akademii Nauk SSSR* [*Reports of the Academy of Sciences of the U.S.S.R.*], Tom. 108, No. 5, 1956, p. 799–801. [Calculation for 74 ports, for three 7-year periods.]

NUTT, DAVID C., *and* COACHMAN, LAWRENCE K. The oceanography of Hebron Fjord, Labrador. *Journal of the Fisheries Research Board of Canada*, Vol. 13, No. 5, 1956, p. 709–58, map, diagrs. [Results of studies in 1949, 1952 and 1954. Includes ice formation.]

SOOT-RYEN, T. Report on the hydrographical conditions in west-Finnmark March-April, 1935. *Acta Borealia. A. Scientia*, No. 10, 1956, 37 p. illus., maps. [Norwegian Sea.]

CARSOLA, ALFRED J. Microrelief on Arctic sea floor. *Bulletin of the American Association of Petroleum Geologists*, Vol. 38, No. 7, 1954, p. 1587–1601, illus. [Interpretation of echo-soundings made by U.S. Navy expeditions to Beaufort and Chukchi seas, 1950–52.]

CARSOLA, ALFRED J. Submarine canyons on the arctic slope. *Journal of Geology*, Vol. 62, No. 6, 1954, p. 605–10, illus., maps. [Interpretation of soundings made by U.S. Navy expeditions to Beaufort and Chukchi seas, 1950–51.]

SHLYAMIN, BORIS ALEKSANDROVICH. *Okhotskoye more* [*Sea of Okhotsk*]. Moscow, Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury [State Publishing House for Geographical Literature], 1957. 96 p. illus., maps. 20 cm. [Physical geography of sea and its shores; brief history of exploration.]

[FALKLAND ISLANDS DEPENDENCIES: TIDES] Antarctic tides. *International Hydrographic Bulletin*, 1956, No. 11, p. 431. [Abstract of article on tidal observations in Falkland Islands Dependencies carried out by Chilean fleet 19 December 1955–21 January 1956, published in *Boletín Informativo del Departamento de Navegación e Hidrografía de la Armada*, Año 12, No. 42, 1956.]

GOUGENHEIM, ANDRÉ. Observations de marée en Terre Adélie pendant l'année 1950. *Bulletin d'Information du Comité Central d'Océanographie et d'Étude des Côtes* (Paris), 4e Année, No. 5, 1952, p. 194–203, illus. [Method and results of tidal observations carried out by Expéditions Polaires Françaises at Port-Martin, Terre Adélie, 1950.]

TABUTEAU, FRANÇOIS, *and others*. *Terre Adélie 1950–1952. Marées. 1re. partie: observations par François Tabuteau et Mario Marret. 2e. partie: analyse et discussion des résultats par Bertrand Imbert.* Paris, Expéditions Polaires Françaises, 1956. [ii], 87 p. illus., maps. 32 cm. (*Expéditions Polaires Françaises, Missions Paul-Emile Victor. Expéditions Antarctiques. Résultats scientifiques* No. S. 2. 4) [Tidal observations: data recorded and analysed. English and German summaries, p. 81–82.]

GOUGENHEIM, ANDRÉ. Les récents travaux bathymétriques français dans l'Océan Antarctique. *Bulletin d'Information du Comité Central d'Océanographie et d'Etude des Côtes* (Paris), 5e Année, No. 2, 1953, p. 61–66, maps. [Soundings made by Expéditions Polaires Françaises from *Commandant Charcot* in Southern Ocean, 1948–51.]

HERDMAN, HENRY F. P. Recent bathymetric charts and maps of the Southern Ocean and waters around Antarctica. *Deep Sea Research*, Vol. 4, No. 2, 1957, p. 130–37, map. [Charts and maps discussed; various interpretations of ocean floor relief.]

ZHIVAGO, A. V., *and* LISITSYN, A. P. Novyye dannyye o rel'yefe dna i osadkakh morey vostochnoy antarktiki [New data on bottom relief and deposits of the seas of the eastern Antarctic]. *Izvestiya Akademii Nauk SSSR. Seriya Geograficheskaya* [*News of the Academy of Sciences of the U.S.S.R. Geographical Series*], 1957, No. 1, p. 19–35, maps. [Based on cruise of *Ob'* in South Atlantic and South Indian Oceans, 1955–56.]

DUNBAR, MAXWELL JOHN. The present status of climatic change in the Atlantic sector of northern seas, with special reference to Canadian eastern arctic waters. *Transactions of the Royal Society of Canada*, Vol. 49, Series 3, 1955, p. 1–7. [Short cycle variation in surface temperatures discussed.]

KING, J. A. The bottle that drifted to Australia. *News Letter* (Weather Bureau, Pretoria), No. 85, 1956, p. 2, diagr. [Sealed bottle dropped by author in Weddell Sea at 68° 52′ S., 11° 12′ W., 24 February 1950, found at Frenchman's Bay, Albany, Western Australia, 1956. Second bottle released at 69° 08′ S., 10° 5′ W., 22 February 1950 and found near Millicent, South Australia, 5 May, 1956, reported in *ibid.*, No. 87, 1956, p. 4.]

METEOROLOGY. CLIMATOLOGY

KNUDSEN, E. HJORTENBERG. Danmarkshavn i arbejde og fritid. *Grønland*, 1956, Nr. p. 13–19, illus. [Life and work at Danish meteorological station at Danmarkshav East Greenland.]

ROBITAILLE, BENOÎT. Les postes de météorologie canado-américains de l'archipel de Reine Elizabeth, territoires du Nord-Ouest. *Cahiers de Géographie de Québec*, Nouve Série, No. 1, 1956, p. 85–86. [Establishment of meteorological stations, in Que Elizabeth Islands, Northwest Territories, 1947–50; their work and maintenance.]

KLYUKIN, N. K. Vysokogornaya meteostantsiya v verkhov'yakh Kolymy [Mounta meteorological station in the upper reaches of the Kolyma]. *Priroda* [*Nature*], 195 No. 4, p. 55–58, illus. [Built in 1956 at 2000 m. on Mus-Khaya, in Oymyak region.]

SCHMITT, W. Weather stations in Antarctica, 30. 6. 1956. *News Letter* (Weather Burea Pretoria), No. 87, 1956, p. 4–6, map. [Lists stations established at this date for Int national Geophysical year, 1957–58.]

[GOUGH ISLAND : METEOROLOGICAL STATIONS] Besoek aan Gough en Tristan da Cunh *News Letter* (Weather Bureau, Pretoria), No. 86, 1956, p. 1–3. [Account by editor *News Letter* of establishment of South African meteorological station on Gough Islan May 1956.]

CHAPMAN, SYDNEY. The International Geophysical Year. *Advancement of Science*, Vol. No. 52, 1957, p. 259–68. [Nature and plans.]

FRASER, RONALD. *Once round the sun : the story of the International Geophysical Year 1957–* London, Hodder & Stoughton, 1957. 160 p. illus. 21 cm. [Outline of present g physical knowledge and programme of I.G.Y.]

ROBIN, GORDON DE QUETTEVILLE. I.G.Y.: the stage is set. *Geographical Magazine*, Vol. No. 3, 1957, p. 109–18, illus. [Outline of routine observations to be made through the International Geophysical Year, 1957–58.]

[INTERNATIONAL GEOPHYSICAL YEAR 1957–58] *British National Committee for the Int national Geophysical Year. United Kingdom report to the fourth Antarctic confere (Paris 13 June–15 June 1957)*. London, Royal Society, 1957. 16 p. illus. 24½ c [Scientific work at Royal Society Base, Halley Bay, June 1956–May 1957. Outline activities of Commonwealth Trans-Antarctic Expedition and Falkland Islands Dep dencies Survey. Includes preliminary meteorological data.]

[INTERNATIONAL GEOPHYSICAL YEAR 1957–58] *The United Kingdom contribution to International Geophysical Year 1957–58*. London, Royal Society, 1957. 72 p. ill maps. 25½ cm. 10*s*. [Historical background, present programme and station lis Establishment and programme of Halley Bay base.]

[INTERNATIONAL GEOPHYSICAL YEAR 1957–58] Det internationella geofysiska året 1957– *Statens Naturvetenskapliga Forskningsråds Årsbok* (Stockholm), Årg. 9, 1955 (p 1956), p. 336–39. [Programme and financing of Swedish participation in Internatio Geophysical Year, 1957–58.]

BYRD, RICHARD EVELYN. All-out assault on Antarctica. *National Geographic Magazi* Vol. 110, No. 2, 1956, p. 141–79, map, illus. [General account of U.S. plans for Int national Geophysical Year, 1957–58.]

TAUBER, G. M. Aerometeorologicheskiye issledovaniya v Antarktide I Sovetskoy antark cheskoy ekspeditsii 1955–1957 gg. [Aerological investigations in Antarctica by t First Soviet Antarctic Expedition, 1955–57]. *Meteorologiya i Gidrologiya* [*Meteorol and Hydrology*], 1957, No. 6, p. 3–11. [Summary of results of upper air studies Mirnyy.]

DALZIEL, K. Rawin measurements at Heard Island. *Australian Meteorological Magazi* No. 10, 1955, p. 47–56, illus. [Description of radio-theodolite for use in upper wi observations.]

WINSTON, JAY S. Physical aspects of rapid cyclogenesis in the Gulf of Alaska. *Tell* Vol. 7, No. 4, 1955, p. 481–500, illus., maps. [Based on study of case of intense develo ment of cyclone in February 1950.]

HELGASON, BJARNI. Heildargeislun sólar í Reykjavík. *Náttúrufræðingurinn*, Árg. Hefti 2, 1956, p. 65–76, illus. [Total solar and sky radiation in Reykjavík, Icela studied 1954–55. English summary.]

RICE, MARY L. An annotated bibliography on night airglow. *Meteorological Abstracts Bibliography*, Vol. 8, No. 2, 1957, p. 213–49. [Annotated references to 162 publicatio arranged in chronological order and classified by U.D.C.]

ZIKEEV, NIKOLAY T. Selective and annotated bibliography on frost and frost forecasti *Meteorological Abstracts and Bibliography*, Vol. 4, No. 3, 1953, p. 337–97. [358 referen arranged chronologically and classified by U.D.C.]

Loewe, Fritz, *and* Lamb, H. H. Meteorology and Antarctic discoveries. *Geographical Journal*, Vol. 122, Part 4, 1956, p. 535–36. [Lamb's attribution of strong katabatic winds in Terre Adélie to possible major elevations of Antarctic continent at Lat. 80° S., Long. 80° E. (*ibid.*, Vol. 121, Part 3, 1955, p. 334–49) contested by Loewe. Reply by Lamb.]

Hesselberg, Th., *and* Birkeland, B. J. The continuation of the secular variations of the climate of Norway 1940–50. *Geofysiske Publikasjoner*, Vol. 15, No. 5, 1956, 40 p. illus. [Includes Svalbard.]

Livingstone, D. A. Pollen analysis of a valley fill near Umiat, Alaska. *American Journal of Science*, Vol. 255, No. 4, 1957, p. 254–60, diagr. [Layers correlated with established chronology of central Brooks Range.]

Vegard, L. Composition, variations and excitation of the auroral luminescence spectra. *Geofysiske Publikasjoner*, Vol. 19, No. 9, 1956, 51 p. illus. [Auroral spectrograms obtained at Tromsø observatory, winters 1951–52, 1952–53.]

Elvey, C. T. Problems of auroral morphology. *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 43, No. 1, 1957, p. 63–75, illus., maps. [Discussion of types of auroral displays which are observed, with examples drawn from Alaska.]

STRATIGRAPHY. PETROLOGY

Mackay, J. R., *and* Mathews, W. H. Superficial geology of the Firth River archaeological site, Yukon Territory. *Arctic*, Vol. 9, No. 3, 1956, p. 210–11. [Stratigraphic studies, August–September 1956.]

Rose, E. R. Manicouagan Lake–Mushalagan Lake area, Quebec (map with marginal notes). *Geological Survey of Canada. Paper* 55–2, 1955, 1 sheet, map. [Descriptive notes on Precambrian and early Palaeozoic stratigraphy.]

Budding, A. J., *and* Kirkland, S. J. T. The geology of the Reindeer River area. *Saskatchewan Department of Mineral Resources*, Report No. 22, 1956, 42 p. illus., folding map. [Regionally metamorphosed Precambrian sediments, volcanics and migmatites invaded by basic and acid intrusives.]

Holmsen, Per. Hyolithus-sonens basale lag i Vest-Finnmark. *Norges Geologiske Undersøkelse*, Nr. 195, Årbok 1955 (pub. 1956), p. 65–72, illus., map. [Basal layers of autochthonous Cambrian substratum of Caledonides in west Finnmark, north Norway. English summary.]

Drever, Harald I. The geology of Ubekendt Ejland, west Greenland. Part II. The picritic sheets and dykes of the east coast. *Meddelelser om Grønland*, Bd. 137, Nr. 4, 1956, 39 p. illus. [Petrology.]

Osborne, F. Fitz. Chemical compositions of the Grenville and the southern part of the Timiskaming-Keewatin subprovince in Quebec. *Transactions of the Royal Society of Canada*, Vol. 50, Series 3, Section 4, 1956, p. 53–63, diagrs. [Analyses of rocks from Quebec Precambrian.]

Marenina, T. Yu. Geologo-petrograficheskiy ocherk Mutnovskogo vulkana [Geological and petrographic outline of Mutnovskiy Vulkan]. *Trudy Laboratorii Vulkanologii* [*Transactions of the Laboratory of Vulcanology*], Vyp. 12, 1956, p. 3–52, illus. [Petrography of rocks associated with this Kamchatka volcano.]

Oosterom, M. G. Some notes on the Lille Kufjord layered gabbro, Seiland, Finnmark, northern Norway. *Norges Geologiske Undersøkelse*, Nr. 195, Årbok 1955 (pub. 1956), p. 73–87, illus., map. [Petrology.]

ECONOMIC GEOLOGY. MINERALS

Sørensen, Henning. Uran og thorium. *Grønland*, 1956, Nr. 6, p. 217–26, illus. [Possibilities of discovering uranium and thorium in Greenland.]

Twenhofel, W. S. Potential Alaskan mineral resources for proposed electrochemical and electrometallurgical industries in the Upper Lynn Canal area, Alaska. *United States Geological Survey Circular* 252, 1953, 14 p. map. [Discussion of available mineral resources that could be developed if electric power were made available from proposed Upper Lyn Canal hydro-electric scheme.]

Ray, Richard Godfrey. Geology and ore deposits of the Willow Creek mining district, Alaska: a study of the general and economic geology of a lode gold mining district in southern Alaska, with particular emphasis on the significance of vein, dike and fault patterns. *United States Geological Survey Bulletin* 1004, 1954, v, 86 p. illus., maps (some folding at end).

Gault, H. R., *and others*. Reconnaissance for radioactive deposits in the northeastern part of the Seward Peninsula Alaska, 1945–47 and 1951, by H. R. Gault, P. L. Killeen,

W. S. West, and others. *United States Geological Survey Circular* 250, 1953, iv, 31 maps (3 in end pocket). [Radioactive minerals discovered in placer deposits of are examined, but no bedrock occurrences of importance reported.]

Killeen, P. L., *and* Ordway, R. J. Radioactivity investigations at Ear Mountain, Sewar Peninsula, Alaska, 1945. *United States Geological Survey Bulletin* 1024C, 1955, p. 59–9 map (in end pocket). [Prospecting for radioactive minerals. Area does not warra further detailed investigations.]

Moxham, Robert M., *and* West, Walter S. Radioactivity investigations in the Serpentin Kougarok area, Seward Peninsula, Alaska, 1946. *United States Geological Surv Circular* 265, 1953, 11 p. map. [Radioactivity of placer material attributed to accesso minerals. No workable deposits recorded.]

Nelson, Arthur E., *and others*. Reconnaissance for radioactive deposits in eastern Alask 1952, by A. E. Nelson, Walter S. West and John J. Matzko. *United States Geologic Survey Circular* 348, 1954, 21 p. maps. [Maximum radioactivity recorded is 0·003 % equivalent uranium; no appreciable anomalies reported.]

Robinson, G. D., *and others*. Radioactivity investigations in the Cache Creek area, Yentn district, Alaska, by G. D. Robinson, Helmuth Wedow, jr., and J. B. Lyons. *Unite States Geological Survey Bulletin* 1024-A, 1955, iv, 23 p. illus., map (in end pocket [Field and laboratory investigations for radioactive minerals. Placer deposits do no contain sufficient amounts of radioactive minerals to be considered as importan uranium and thorium reserves.]

Wedow, Helmuth, *jr*. Reconnaissance for radioactive deposits in the Eagle–Nation are east-central Alaska, 1948. *United States Geological Survey Circular* 316, 1954, 9 p (map in end pocket). [Examination of various localities revealed no exceptional radio active deposits. Phosphatic nodules in black shales are reported to be highly radio active.]

West, Walter S., *and* Benson, Paul D. Investigations for radioactive deposits in south eastern Alaska. *United States Geological Survey Bulletin* 1024-B, 1955, p. 25–57, ma (in end pocket). [Prospecting for radioactive mineral deposits. No uranium deposit of commercial value in five areas examined.]

West, Walter S. Reconnaissance for radioactive deposits in the Darby Mountains, Sewar Peninsula, Alaska, 1948. *United States Geological Survey Circular* 300, 1953, 7 p. (ma in end pocket). [Radioactivity in this area is related to granite occurrences and t thorianite in placers.]

White, M. G., *and* Killeen, P. L. Reconnaissance for radioactive deposits in the Lowe Yukon–Kuskokwim Highlands region, Alaska, 1947. *United States Geological Surve Circular* 255, 1953, iv, 18 p. maps. [Investigations over a wide area have revealed n high grade deposits. Reported radioactivity due to thoria in zircon and monazite.]

White, Max G., *and* Stevens, John M. Reconnaissance for radioactive deposits in th Ruby–Poorman and Nixon Fork districts, west-central Alaska, 1949. *United Stat Geological Survey Circular* 279, 1953, 19 p. maps. [Radioactivity of granites and plac deposits due to thorium content of accessory minerals. Thick vegetation cover pr cluded discovery of bedrock source.]

Møller, Chr. K. X-ray investigation of bøggildite. *Meddelelser om Grønland*, Bd. 137, N 6, 1956, 8 p. illus. [New mineral discovered at Ivigtut, south-west Greenland, 1950.

Pauly, Hans. Bøggildite: a new phosphate-fluoride from Ivigtut, south Greenlan *Meddelelser om Grønland*, Bd. 137, Nr. 6, 1956, 16 p. illus. [Description of miner discovered by R. Bøgvad in 1950.]

PALAEONTOLOGY

Bolkhovitina, N. A. Atlas spor i pyl'tsy iz yurskikh i nizhnemelovykh otlozheniy Vilyu skoy vpadiny [Atlas of spores and pollen from Jurassic and Lower Cretaceous deposi of the Vilyuy depression]. *Trudy Geologicheskogo Instituta* [*Transactions of the Geologic Institute*], Vypusk 2, 1956, 188 p. illus. [Systematic list, with distribution geographi ally and by geological horizons.]

Rosenkrantz, Alfred. A large Velata from the Lower Jurassic of east Greenland. *Me delelser fra Dansk Geologisk Forening*, Bd. 13, Hefte 2, 1956, p. 79–84, illus. [Descriptio of *Velata hartzi* n. sp.: material collected in Jameson Land.]

Birkelund, Tove. Upper Cretaceous Belemnites from west Greenland. *Meddelelser o Grønland*, Bd. 137, Nr. 9, 1956, 28 p. illus., map. [Description of six species; materi collected in northern west Greenland in 1946–54.]

Nielsen, Eigil. Spændende fossilfund i Nordøstgrønland. *Grønland*, 1956, Nr. 8, p. 300–0 illus. [Significance of Permian fossils discovered in Scoresby Sund–Danmarks Hav area, east Greenland.]

BIOLOGY. ARCHAEOLOGY. ANTHROPOLOGY

HICKS, S. D. Natural history survey of Coppermine, Northwest Territories, 1951. *Canadian Field-Naturalist*, Vol. 69, No. 4, 1955, p. 162–66. [Special reference to insects.]

VEBÆK, C. L. Mellembygden. *Grønland*, 1956, Nr. 3, p. 92–98, illus., map. [Area of mediaeval Scandinavian settlement in Arsuk-Ivigtut district, south-west Greenland; excavations by Danish National museum in 1954.]

COLLINS, HENRY B. Excavations of Thule and Dorset culture sites at Resolute, Cornwallis Island, N.W.T. *Bulletin. National Museum of Canada* No. 136, 1955, p. 22–35, illus. (*Annual Report of the National Museum of Canada for the fiscal year 1953–54.*) [Summer 1953.]

MACNEISH, RICHARD S. Two archaeological sites on Great Bear Lake, Northwest Territories, Canada. *Bulletin. National Museum of Canada*, No. 136, 1955, p. 54–84, illus., map. (*Annual Report of the National Museum of Canada for the fiscal year 1953–54.*) [Artifacts described from 1952 summer excavations.]

LAUGHLIN, WILLIAM S., *and* MARSH, GORDON H. Trends in Aleutian chipped stone artifacts. *Anthropological Papers of the University of Alaska*, Vol. 5, No. 1, 1956, p. 5–21, illus. [Comparison of Eskimo tools and knives excavated on Umnak Island, 1949–52.]

LEFEBRE, CHARLENE CRAFT. A contribution to the archaeology of the upper Kuskokwim. *American Antiquity*, Vol. 21, No. 3, 1956, p. 268–74, illus. [Alaska. Results of author's field work, 1949.]

OSWALT, WENDELL. Recent pottery from the Bering Strait region. *Anthropological Papers of the University of Alaska*, Vol. 2, No. 1, 1953, p. 5–18, illus. [Study of 7000 sherds from Seward Peninsula and St Lawrence Island.]

VANSTONE, JAMES W. Archaeological excavations at Kotzebue, Alaska. *Anthropological Papers of the University of Alaska*, Vol. 3, No. 2, 1955, p. 75–155, illus., map. [Results of excavation of eight house pits by author, 1951. Bibliography, p. 139–41.]

VANSTONE, JAMES W. Pottery from Nunivak Island, Alaska. *Anthropological Papers of the University of Alaska*, Vol. 2, No. 2, 1954, p. 181–93, illus., map. [Collected by author, 1952.]

CHARD, CHESTER S. Chronology and culture succession in the northern Kuriles. *American Antiquity*, Vol. 21, No. 3, 1956, p. 287–92. [Preliminary report from Japanese source material.]

OKLADNIKOV, A. P., *and* GURVICH, I. S. Drevniye poseleniya v del'te r. Indigirki [Ancient settlements in the delta of the river Indigirka]. *Akademiya Nauk SSSR. Institut Etnografii. Kratkiye Soobshcheniya* [*Academy of Sciences of the U.S.S.R. Institute of Ethnography. Short Communications*], No. 27, p. 42–51, illus. [Description and analysis of recently found artifacts.]

SERNING, INGA. Järnåldern i norra Fennoskandia: en översikt och en jämförelse. *Västerbotten*, Årg. 37, 1956, p. 1–25, illus. [Survey and comparison of iron age finds in northern Scandinavia.]

GUILDAL, I. A. Den grønlandske befolknings dyriske snyltere. *Grønland*, 1956, Nr. 1, p. 33–40, illus. [Animal parasites in human population of Greenland.]

BOTANY

BÖCHER, TYGE W., *and others. Grønlands flora, af Tyge W. Böcher, Kjeld Holmen og Knud Jakobsen. Med illustrationer af Ingeborg Frederiksen.* København, Haase og Søn, 1957. 313 p. illus., map. 19½ cm. [Complete systematic list of Greenland vascular plants; description, habitat, occurrence. Abbreviation system for English-speaking users.]

RITCHIE, J. C. Studies on the flora and vegetation of the taiga zone of northern Manitoba. *Arctic*, Vol. 9, No. 3, 1956, p. 211–12. [Outline of investigations, June–August 1946.]

CODY, W. J., *and* CHILLCOTT, J. G. Plant collections from Matthews and Muskox lakes, Mackenzie District, N.W.T. *Canadian Field-Naturalist*, Vol. 69, No. 4, 1955, p. 153–62. [Annotated list of plants collected 1953.]

PORSILD, ALF ERLING. Illustrated flora of the Canadian Arctic archipelago. *National Museum of Canada. Bulletin*, No. 146, 1957, iii, 209 p. illus., maps. $2. (*Biological Series*, No. 50.) [Guide to 340 species. Includes distribution maps.]

SAVILE, D. B. O., *and* CALDER, J. A. Notes on the flora of Chesterfield Inlet, Keewatin District, N.W.T. *Canadian Field-Naturalist*, Vol. 68, No. 4, 1952, p. 103–07. [Annotated list of additions to recorded flora from Savile's collection, 1950.]

SCHOFIELD, W. B., *and* CODY, W. J. Botanical investigations on coastal southern Cornwallis Island, Franklin District N.W.T. *Canadian Field-Naturalist*, Vol. 69, No. 3, 1955, p. 116–28, maps. [Annotated list of specimens collected in 1949.]

CODY, W. J. New plant records from Bathurst Inlet, N.W.T. *Canadian Field-Naturalis* Vol. 68, No. 1, 1954, p. 40. [Species collected 1951.]

SOLONEVICH, N. G. Materialy k ekologo-biologicheskoy kharakteristike bolotnykh trav kustarnichkov [Ecological and biological characteristics of bog grasses and sma shrubs]. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Fa North of the U.S.S.R. and its Utilization*], Vypusk 2, 1956, p. 307–497, illus. [Based o field work in bogs of north-western U.S.S.R., 1946–51.]

GORODKOV, B. N. Rastitel'nost' i pochvy o. Kotel'nogo (Novosibirskiy arkhipelag) [Veget tion and soils of Ostrov Kotel'nyy (Novosibirskiy archipelago)]. *Rastitel'nost' Krayneg Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of the U.S.S.R. and i Utilization*], Vypusk 2, 1956, p. 7–132, illus. [Monograph on flora of island, subdivide by natural regions.]

ALEKSANDROVA, V. D. Rastitel'nost' yuzhnogo ostrova Novoy Zemli mezhdu 70° 56′ 72° 12′ s.sh. [Vegetation of the south island of Novaya Zemlya between lat. 70° 56′ an 72° 12′ N.]. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Fa North of the U.S.S.R. and its Utilization*], Vypusk 2, 1956, p. 187–306, illus. [Based o author's field work, 1931–33.]

KUVAYEV, V. B. Rastitel'nost' vostochnogo Verkhoyan'ya [Vegetation of the easter Verkhoyansk region]. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetatio of the Far North of the U.S.S.R. and its Utilization*], Vypusk 2, 1956, p. 133–86, illu [Collections made in 1951.]

SKOTTSBERG, CARL. On two collections of antarctic marine algae. *Arkiv för Botanik*, Serie Bd. 2, Nr. 7, 1953, p. 531–66, illus. [Locality, description, habitat, distribution species collected in Graham Land, 1944–45 by I. M. Lamb, and in Terre Adélie an Enderby Land, 1929–31, by British Australian New Zealand Antarctic Researc Expedition.]

GROVES, J. WALTON, *and* HOARE, SHEILA C. Notes on fungi from northern Canada. 1. Hypo creales and Discomycetes. *Canadian Field-Naturalist*, Vol. 68, No. 1, 1954, p. 1– [Specimens collected, 1948–51.]

GROVES, J. WALTON, *and* THOMSON, SHEILA. Notes on fungi from northern Canada. 2. Bol taceae. *Canadian Field-Naturalist*, Vol. 69, No. 2, 1955, p. 44–51. [Specimens collecte 1948–51.]

CAIN, ROY F. Studies of coprophilous Ascomycetes. 6. Species from the Hudson Bay are *Canadian Journal of Botany*, Vol. 35, No. 3, 1957, p. 255–68, illus. [Annotated lis 26 species recorded.]

SAVILE, D. B. O. Notes on boreal Ustilaginales. 2. *Canadian Journal of Botany*, Vol. 3 No. 3, 1957, p. 279–86. [Annotated list. Results of field work in British Columbi Includes records from other arctic regions.]

EYERDAM, WALTER JACOB. The genus Sphagnum in Alaska. *Bryologist*, Vol. 58, No. 3, 195 p. 211–15. [Annotated list of 20 specimens and one variety.]

BARTRAM, EDWIN B. Mosses from the United States Antarctic Service Expedition, 1940–4 *Bryologist*, Vol. 60, No. 2, 1957, p. 139–43. [Annotated list of *Musci*.]

RØNNING, OLAF I. *Draba crassifolia* in Scandinavia. *Acta Borealia. A. Scientia*, No. 1 1956, 20 p. map. [Taxonomy, distribution, ecology of north Scandinavian *Crucifera*

ZOOLOGY

GALKIN, YU. I. *Bryukhonogiye mollyuski trokhidy dal'nevostochnykh i severnykh morey SSS (Semeystvo Trochidae)* [*Trochidae (gastropods) of the far eastern and northern seas of t U.S.S.R.*] Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy Sciences of the U.S.S.R.], 1955. 132 p. illus., maps. 26 cm. (Opredeliteli po Faun SSSR, izdavayemyye Zoologicheskim Institutom Akademii Nauk SSSR [Classifie Lists of the Fauna of the U.S.S.R. published by the Zoological Institute of the Academ of Sciences of the U.S.S.R.], No. 57). [Description, distribution, systematics.]

BAER, JEAN G. Parasitic helminths collected in west Greenland. *Meddelelser om Grønlan* Bd. 124, Nr. 10, 1956, 55 p. illus. [Description of about 20 species of tape-worm foun in ten species of bird and four species of fish in Godhavn area.]

BRINKMANN, AUG., *jr.* Trematoda. In: *The Zoology of Iceland*. Copenhagen and Reykjavík Munksgaard, 1956, Vol. 2, Part 11, 34 p. illus., map. [Systematic list: distributio description. General remarks on zoogeography.]

ALLGÉN, CARL ALGON JÖNSSON. Vergleich zwischen den marinen Nematodenfaun Norwegens und denen des antarktisch-sub-antarktischen Gebietes. *Det Kongeli Norske Videnskabers Selskabs Forhandlinger*, Bd. 28, Nr. 15, 1955, p. 71–76. [Compar son between marine nematode fauna of Norwegian waters and of antarctic and sub antarctic regions.]

ALLGÉN, CARL ALGON JÖNSSON. Ueber eine bemerkenswerte neue Südsee-Art der Nematodengattung Sabatieria De Rouville, S. heterospiculum von Süd-Georgien. *Det Kongelige Norske Videnskabers Selskabs Forhandlinger*, Bd. 26, Nr. 2, 1953, p. 4–6, illus. [New species of nematode genus *Sabatieria*, collected by author off South Georgia in 1902.]

ALLGÉN, CARL ALGON JÖNSSON. Ueber eine ganz bemerkenswerte neue Art der Oxystomatidengattung Trefusia de Man, T. axonolaimoides n. sp. von Süd-Georgien. *Det Kongelige Norske Videnskabers Selskabs Forhandlinger*, Bd. 26, Nr. 12, 1953, p. 48–50, illus. [New species of oxystomatid genus (*Nematoda*), *Trefusia axonolaimoides* n.sp., collected off South Georgia by author in 1902.]

MYERS, BETTY J. Nematode parasites of seals in the eastern Canadian Arctic. *Canadian Journal of Zoology*, Vol. 35, No. 2, 1957, p. 291. [Identification of species collected 1949–55 by Fisheries Research Board of Canada.]

MYERS, BETTY J. Ascaroid parasites of Harp Seals (Phoca gröenlandica Erxleben) from the Magdalen Islands, Quebec. *Canadian Journal of Zoology*, Vol. 35, No. 2, 1957, p. 291–92. [From 195 stomachs, examined 1956.]

MARR, J. W. S. Euphausia superba og de antarktiske overflatestrømmer: en foreløpig meddelelse om hvalfødens utbredelse. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 3, 1956, p. 127–29, 132–34, map. [Preliminary note on distribution of whale krill *Euphausia superba* in antarctic waters; influence of surface currents. In Norwegian and English.]

HACKMAN, WALTER. *The Scatophagidae (Dipt.) of eastern Fennoscandia*. Helsingfors, Societas pro Fauna et Flora Fennica, 1956. 67 p. illus., maps. 26 cm. (Fauna Fennica II). [Systematics, records of 87 species, distribution.]

TORRES, BELINDO ADOLFO. Primer hallazgo de tendipedidos alados en la región Antártica. *Anales de la Sociedad Científica Argentina*, Tomo 161, E. 4–6, 1956, p. 41–52, illus., map. (Contribución del Instituto Antártico Argentino, No. 6.) [Description of species of Diptera, *Podonomus steineni* (Gercke, 1889), collected from King George Island, South Shetland Islands, January 1956.]

PETERSEN, BØRGE. Hymenoptera. In: *The Zoology of Iceland*. Copenhagen and Reykjavík, Munksgaard, 1956, Vol. 3, Part 49–50, 176 p. illus., maps. [Systematic list: distribution, description. General remarks on biology.]

EKLUND, CARL R. Bird and mammal notes from the interior Ungava Peninsula. *Canadian Field-Naturalist*, Vol. 70, No. 2, 1956, p. 69–76, map. [Lists collection made in summer 1949.]

HÖHN, E. O. Birds and mammals observed on a cruise in Amundsen Gulf N.W.T., July 29th–August 16th, 1953. *Canadian Field-Naturalist*, Vol. 69, No. 2, 1955, p. 41–44, map.

NIELSEN, JØRGEN. Mærkningsforsøg med fjeldørred i Grønland. *Grønland*, 1956, Nr. 1, p. 27–32, illus., map. [Marking experiments with Char (*Salvelinus alpinus*) in Greenland; electric stunning for marking purposes.]

LOGIER, E. B. S., *and* TONER, G. C. *Check-list of the amphibians and reptiles of Canada and Alaska*. Toronto, Royal Ontario Museum of Zoology and Palaeontology, 1955. 88 p. maps. (Contribution No. 41.)

SMITH, DONALD A. Northern swamp tree frog, *Pseudacris nigrita septentrionalis* (Boulenger) from Churchill, Manitoba. *Canadian Field-Naturalist*, Vol. 67, No. 4, 1953, p. 181–82. [First four specimens of this species to be recorded from Churchill region.]

JOHANSEN, HANS. Revision und Entstehung der arktischen Vogelfauna. Erster Teil. Einführung und Revision der Gaviae-Galli. *Acta Arctica*, Fasc. 8, 1956, 98 p. maps. [Analysis of birds breeding in Arctic. Part 1. Introduction and analysis of distribution and origin of *Gaviae*, *Podicipedes*, *Tubinares*, *Steganopodes*, *Anseres*, *Accipetres*, *Galli*. English summary.]

SALOMONSEN, FINN. Studying bird stocks and migrations in Greenland. *Danish Foreign Office Journal*, No. 20, 1956, p. 18–20, illus., map. [Bird ringing and results.]

WYNNE-EDWARDS, VERO COPNER. Birds observed at Goose Bay and elsewhere in Labrador. *Canadian Field-Naturalist*, Vol. 70, No. 2, 1956, p. 76–77. [Annotated list, July 1953.]

POLUNIN, NICHOLAS, *and* EKLUND, CARL R. Notes on food habits of waterfowl in the interior of Ungava Peninsula. *Canadian Field-Naturalist*, Vol. 67, No. 3, 1953, p. 134–37. [Stomach contents of six Anatidae and Anseridae analysed, 1949.]

DAVIS, WILLIAM F. Birds observed on a canoe trip in northern Manitoba. *Canadian Field-Naturalist*, Vol. 67, No. 4, 1953, p. 148–54. [Annotated list of birds seen 1951.]

DRURY, WILLIAM H., *jr.* Birds of the Saint Elias quadrangle in the southwestern Yukon Territory. *Canadian Field-Naturalist*, Vol. 67, No. 3, 1953, p. 103–28, maps. [Annotated list of species observed 1948.]

GODFREY, W. EARL. Notes on Ellesmere Island birds. *Canadian Field-Naturalist*, Vol. 67, No. 2, 1953, p. 89–93. [Annotated list compiled from several collections.]

BELOPOL'SKIY, L. O. Rol' mezhvidovykh vzaimootnosheniy v razvitii kolonial'nosti u ptits [Part played by inter-species relations in the development of the tendency to form colonies among birds], *Zoologicheskiy Zhurnal* [*Zoological Journal*], Tom 34, Vypusk 3, 1955, p. 589–600. [Study of bird colonies in Novaya Zemlya and Murman coast.]

Rol'nik, V. V. Inkubatsiya yaits gagi (Somateria mollissima L.) [Incubation of eggs o Eider Duck (*Somateria mollissima* L.)]. *Zoologicheskiy Zhurnal* [*Zoological Journal* Tom 34, Vypusk 4, 1955, p. 885–97. [Experiments in 1939–41 with eggs from Mu manskaya Oblast'.]

Scott, Peter, *and others*. The Wildfowl Trust's second expedition to central Iceland, 195 by Peter Scott, Hugh Boyd and W. J. L. Sladen. *Wildfowl Trust. Seventh Annu Report*, 1953–54 (London), 1955, p. 63–98, illus., map. [Narrative and results o expedition to ring Pink-footed Geese (*Anser brachyrhynchus*). Includes list of Bryophyt collected.]

Howard, P. F. Banding of Giant Petrels at Heard Island and Macquarie Island. 2. *Em* Vol. 56, December 1956, p. 401–04, map. [Particulars of *Macronectes giganteu* recovered 1 September 1954–1 March 1956.

Gudmundsson, Finnur. Íslenzkir fuglar XIII: Rita (*Rissa tridactyla*). *Náttúrufræðingu rinn*, Árg. 26, Hefti 3, 1956, p. 131–37, illus. [Status of kittiwake in Iceland. Englis summary.]

Tuck, Leslie M., *and* Squires, H. J. Food and feeding habits of Brünnich's Murre (*Uri lomvia lomvia*) on Akpatok Island. *Journal of Fisheries Research Board of Canad* Vol. 12, No. 5, 1955, p. 781–92, illus., map. [Ungava Bay, August 1954. Pisces an Invertebrata listed. Mollusc, *Onchidiopsis glacialis* (M. Sars) recorded here for first time

Weeden, Robert B. A field and laboratory study of the ecology, life history and behaviou of Ptarmigan in Alaska. *Arctic*, Vol. 9, No. 3, 1956, p. 212–13. [Outline of work don on *Tetraonidae* 1956.]

Sutton, George Miksch, *and* Parmelee, David F. The rough-legged hawk in the America Arctic. *Arctic*, Vol. 9, No. 3, 1956, p. 202–07, illus. [Observations on *Buteo lagopus* Baffin Island, 1953.]

Hagen, Yngvar. The irruption of Hawk-owls (*Surnia ulula* (L.)) in Fennoscandia, 1950–5 with some remarks on recent micro-rodent cycles. *Sterna*, No. 24, 1956, 22 p. illus maps. [Connexion between vole and lemming frequency and Hawk-owl breeding.]

Schiller, Everett L., *and* Rausch, Robert. Mammals of the Katmai National Monu ment, Alaska. *Arctic*, Vol. 9, No. 3, 1956, p. 191–201, map. [Occurrence and distribu tion studied 1953 in area affected by volcanic eruption of 1912.]

Morrison, Peter R., *and* Tietz, William J. Cooling and thermal conductivity in thre small Alaskan mammals. *Journal of Mammalogy*, Vol. 38, No. 1, 1957, p. 78–86, diagr tables. [Experiments to evaluate effectiveness of insulating layer of fur of *Clethrionomy rutilus dawsoni*, *Microtus economis macfarlani*, *Sorex cinereus hollisteri*.]

Maclennan, J. M., *trans. Translations of Russian game reports*. Vol. 1. (Ottawa, Depart ment of Northern Affairs and National Resources), 1957. 109 p. [Papers on biology an adaptation of Beaver in Soviet Arctic by B. T. Semenov and A. P. Zhdanov.]

Hanson, Tore. Är den vanliga näbbmusen "glacial övervintrare" på Norges kust? *Faun och Flora*, 1956, Häfte 1–2, p. 1–9, illus., map. [Evidence that Common Shrew (*Sore araneus*) "hibernated" on north Norwegian coast during last ice age.]

Slijper, E. J. Some remarks on gestation and birth in Cetacea and other aquatic mammal *Hvalrådets Skrifter*, Nr. 41, 1956, 62 p. illus. [Includes Cetacea and Pinnipedia.]

Clarke, Robert. Hvalmerking med helikopter. *Norsk Hvalfangst-Tidende*, Årg. 45 Nr. 6, 1956, p. 311–18, illus. [Whale marking by helicopter. In Norwegian and English

Brown, S. G. Nylig gjenfunne hvalmerker. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 1 1956, p. 661–64. [Whale marks recovered in 1955–56 in Antarctic. In Norwegian an English.]

Zemskiy, V. A. O metodike opredeleniya sledov zheltykh tel beremennosti i ovulyatsii n yaichnikykh samok finvala [Methods of establishing traces of corpora lutea in ovarie of female baleen whales]. *Byulleten' Moskovskogo Obshchestva Ispytateley Prirody Novaya Seriya. Otdel Biologicheskiy* [*Bulletin of the Moscow Society of Naturalists. Ne Series. Biological Section*], Tom 61, Vypusk 6, 1956, p. 5–13, illus. [New metho described.]

Laws, Richard M., *and* Purves, P. E. Ørepluggen hos bardehval anvendt til alder bestemmelse med spesiell henvisning til nordatlantisk finnhval (*Balœnoptera physalu* Linn.) *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 8, 1956, p. 413–25, illus. [Ear plug *Mysticeti* whales as indication of age, with special reference to North Atlantic Fi Whale. In Norwegian and English.]

Chittleborough, R. G. Aerial observations on the Humpback Whale, *Megaptera nodos* (Bonnaterre), with notes on other species. *Australian Journal of Marine and Freshwat Research*, Vol. 4, No. 2, 1953, p. 219–26, illus. [Movements recorded off Point Cloate Western Australia, 1952.]

Ash, C. E. Finnhvalen i 1954/55. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 1, 1956, p. 45–4 illus. [Blubber thickness in Fin Whales (*Balœnoptera physalus*), 1954–55. In No wegian and English.]

SYMONS, H. W. Noen observasjoner vedrørende øret hos blå- og finnhval. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 1, 1956, p. 37–38, 41–42, 45, illus. [Wax plugs, blubber lump, and foam observed in ears of Blue and Fin Whales (*Balœnoptera musculus*, *Balœnoptera physalus*), 1953–55. In Norwegian and English.]

ASH, C. E. Om størrelsen av den antarktiske finnhvalbestand sett i relasjon til størrelsen av fangsten. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 8, 1956, p. 432–35. [Comment on Per Ottestad's article on size of antarctic Fin Whale stock relative to size of catch (Årg. 45, Nr. 6, 1956, p. 298–308). Reply by Ottestad, *ibid.* Årg. 45, Nr. 9, 1956, p. 480–81.

OTTESTAD, PER. Om størrelsen av den antarktiske finnhvalbestand sett i relasjon til størrelsen av fangsten. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 6, 1956, p. 298–308, illus. [On size of antarctic Fin Whale (*Balœnoptera physalus*) stock relative to size of catch. In Norwegian and English.]

[MAMMOTHS] Nakhodki mamontov. Obzor postupivshikh v redaktsiyu materialov [Mammoth finds. Survey of material reaching the editorial office]. *Priroda* [*Nature*], 1957, No. 5, p. 104–06, illus. [Notes on various finds in Soviet Arctic, 1952–56.]

MCCABE, ROBERT A. Observations on the disappearance of shed caribou antlers. *Journal of Mammalogy*, Vol. 38, No. 2, 1957, p. 275–77. [*Rangifer arcticus arcticus*. Antlers chewed and eaten for nutritive value by caribou and others.]

TENER, J. S. Gross composition of musk-ox milk. *Canadian Journal of Zoology*, Vol. 34, No. 6, 1956, p. 569–71, tables. [*Ovibos moschatus*. Analysis.]

STERNBERG, C. M. A Harp Seal from the Leda Clay west of Hull, Quebec. *Canadian Field-Naturalist*, Vol. 70, No. 2, 1956, p. 97. [Fossils of *Phoca groenlandica*.]

CARRARA, ITALO SANTIAGO. *Observaciones sobre el estado actual de las poblaciones de pinnípedos de la Argentina*. Eva Perón [La Plata], Universidad Nacional de Eva Perón 1954. 17 p. illus., map. 27 cm. [Population study of Pinnipedia on coasts of Argentina and Falkland Islands and their Dependencies, 1952–54.]

TAYLOR, F. H. C., *and others*. *Distribution and food habits of the fur seals of the North Pacific Ocean; report of cooperative investigations by the governments of Canada, Japan and the United States of America, by F. H. C. Taylor, M. Fujinaga and Ford Wilke*. Washington, D.C., United States Fish and Wildlife Service, 1955. x, 86 p. illus. 26 cm. 50c. [*Callorhinus ursinus*. Results of 1952 investigation by biologists of Canada, Japan and U.S.A.]

[FUR SEALS : NORTH PACIFIC] Ostrov Tyuleniy. *Geografiya v Shkole* [*Geography in School*], 1957, No. 3, p. 63. [75,000 Fur Seals at present here (formerly Robben Island).]

ROSENDAHL, PH. Kan Grønland give fredningsregler udenfor sit søterritorium? *Atuagagdliutit/Grønlandsposten*, 1956, Nr. 1, p. 6–8, maps. [Applicability of national wild life protection regulations to extra-territorial waters, with special reference to Walrus (Odobaemidae) in Greenland waters.]

DAVIES, J. L. The Grey Seal at the Isles of Scilly. *Proceedings of the Zoological Society of London*, Vol. 127, Part 2, 1956, p. 161–66, map. [*Halichoerus grypus*. Results of author's survey, 1952 and 1953.]

MEDICAL SCIENCES

DEB, C., *and* HART, J. S. Hematological and body fluid adjustment during acclimation to a cold environment. *Canadian Journal of Biochemistry and Physiology*, Vol. 34, 1956, p. 959–66, tables, diagrs. [Results of laboratory experiments on rats.]

HEROUX, O., *and others*. Metabolism and muscle activity of anaesthetized warm and cold acclimated rats on exposure to cold, by O. Heroux, J. S. Hart and F. Depocas. *Journal of Applied Physiology*, Vol. 9, No. 3, 1956, p. 399–403, illus. [Experiment to demonstrate importance of chemical thermogenesis as against physical thermogenesis in cold acclimatization of rats.]

FERRER, M. IRENÉ, *ed*. *Cold injury: transactions of the Fourth Conference, November 7, 8 and 9, 1955, Princeton, N.J. . . . sponsored by the Josiah Macy Jr. Foundation*, [c1956]. 371 p. illus. 23½ cm. $5.95. [Verbatim report of papers and discussions by medical specialists.]

ENGINEERING AND TECHNOLOGY. TRANSPORT ENGINEERING

SVEISTRUP, P. P. Kryoliten og staten. *Grønland*, 1956, Nr. 2, p. 41–49, illus. [History of Danish State's concessions to private companies to mine cryolite at Ivigtut, west Greenland, since about 1853.]

JACOT, MICHAEL. Oil field on top of the world. *Imperial Oil Review*, Vol. 39, No. 1, 1955, p. 2–6, illus. [Norman Wells refinery, Northwest Territories, Canada.]

ÅHLIN, K. Isfri ränna med komprimerad luft. *Svenska Vägföreningens Tidskrift*, Årg. 41 Häfte 2, 1954, p. 76–77, [106], illus. [Keeping ferry channels free of ice by compressed air released from pipes along bottom: tests by Swedish Väg- och Vattenbyggnadsstyrelsen. English summary.]

LAGUTIN, B. L., *ed. Data on the problem of ice crossings. Revised edition of translations* [*Translated by Eugene A. Golomshtok*]. Boston, Mass., Arctic Construction and Frost Effects Laboratory, Corps of Engineers, U.S. Army, New England Division, 1954. 122 p. 4 leaves. illus. 26½ cm. (Investigation of construction and maintenance of airdromes on ice fiscal year 1954.) [Symposium of 6 articles on load capacity of ice and effect of traffic on ice. Originally published in *Glavnoye Upravleniye Gidrometeorologicheskoy Sluzhby. Trudy Nauchno-Issledovatel'skikh Uchrezhdeniy.* Seriya 5, Vyp. 20. Sverdlovsk, Moscow, 1946.]

JUMIKIS, ALFREDS R. *The frost penetration problem in highway engineering.* New Brunswick, N.J., Rutgers University Press, 1955. xxvi, 162 p. illus. 26 cm. [Theoretical approach.]

NICHOLS, R. J., *and* PRICE, W. I. J. Salt treatment for clearing snow and ice. *Surveyor* No. 115, (3368), 1956, p. 886–88, illus. [Summary of experiments in Cheshire, 1951–56.]

[ROADS : ANTI-ICING METHODS] Electrical heating of roads. In: *Road Research, 1956* (London, Her Majesty's Stationery Office, 1957), p. 59. [Preliminary trials on heating small sections of road electrically to prevent ice formation.]

LEE, C. R. Surface temperatures in concrete dams subject to frost. *Report by the International Sub-Committee on Concrete for Large Dams to the 5th Congress on Large Dams Paris, 1955*, R. 70, Question No. 19, p. 77–79, diagr. (Paper No. 6.) [Measurements made at Upper Glendevon dam, Ochil Hills, Scotland, show relation between air and surface temperatures.]

MARKIN, A. Energetiki sklonyayutsya nad kartoy mira [Power engineers bend over the map of the world]. *Novyy Mir* [*New World*], 1956, No. 1, p. 210–17. [Contains outline of A. I. Shumilin's plan to dam Bering Strait. Few details; realisation clearly not imminent.]

CLARK, LLOYD K., *and* ALTER, AMOS J. Water supply in arctic areas: design features. *Journal of the Sanitary Engineering Division of the American Society of Civil Engineers* Vol. 82, No. SA2, 1956, 11 p. (Reprint. Paper 931.) [Practical difficulties to be overcome.]

ROSENDAHL, GUNNAR P. Vandforsyningsproblemer i Grønland. *Atuagagdliutit/Grønlandsposten*, 1956, No. 18, p. 8. [Water supply problems in Greenland.]

FOURNELLE, H. J., *and* PAGE, W. B. Experimental ground water pollution at Anchorage, Alaska. *Public Health Reports* (U.S. Public Health Service), Vol. 72, No. 3, 1957, p. 203–09, diagrs. [Test method for tracing movement of chemicals and bacteria causing pollution in ground during winter in subarctic climate.]

DAVIS, S. C. H. Getting to grips with snow. *Autocar*, Vol. 99, No. 3026, 1953, p. 858–60, illus. [Various tyres and treads considered for use during European winters.]

WILLIAMS, LARRY. A ski sled. *Sierra Club Bulletin*, Vol. 39, No. 6, 1954, p. 94–95. [Collapsible. For mountaineers. Construction details.]

EASTON, A. H. Traction and stability of front, rear, and four-wheel drive trucks on lake ice: series of 1949. *Proceedings of the 29th Annual Meeting of the Highway Research Board* December 1949, p. 319–36, illus. [Tests show maximum stability and traction of four-wheel drive.]

JANSSON, JAN-ERIK. Isbrytare och deras konstruktion. *Navigator* (Helsingfors), Årg. 31 No. 12, 1956, p. 236–39, 252–53. [Development of icebreakers since 1871 and principles of their construction.]

[SHIPS : ANTI-ICING METHODS] Are deck trappings responsible for icing-up of trawlers? Improved designs incorporated in foreign vessels built in Britain. *Fishing News* No. 2249, 1956, p. 4. [Current research on trawler anti-icing methods debated in House of Commons.]

[SHIPS : ANTI-ICING METHODS] Effect of design on trawler speed and liability to icing. Points discussed by naval architects and practical men. *Fishing News*, No. 2247, 1956, p. 9–10, diagr. [Flared bow type of vessel said to throw spray clear of trawler and reduce icing.]

[SHIPS : *Oden*] 10500 Lk:s havsisbrytare "Oden" för Sverige. *Navigator* (Helsingfors) Årg. 31, No. 11, 1956, p. 215, illus. [Details of icebreaker *Oden* being built for Sweden in Helsingfors.]

MAZIN, I. P. Ob oledenenii skorostnykh samoletov [Icing of fast aircraft]. *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], 1957, No. 4, p. 3–8. [Theoretical argument that icing should not be possible at supersonic speeds even in severely supercooled clouds.]

[Aircraft Skis] Jet powered skis. *United States Naval Institute Proceedings*, Vol. 83, No. 2, 1957, p. 241–42, illus. [Brief note on skis fitted to jet aircraft P2V-7 "Neptune" for use during U.S. "Operation Deep Freeze".]

Langlois, Claude. Knob Lake, pivot aerien de l'Arctique canadien. *Revue Canadienne de Géographie*, Vol. 9, No. 4, 1955, p. 201–06, maps. [Possibility of transforming existing airstrip into future international airport.]

Rees, D. B. Article on snow handling on Canadian airports. *ICAO Circular* (Montreal), 43-AN/38, 1955, p. 13–30, illus. [Mechanical methods of removal and compaction.]

[Snow and Ice Removal] Ice and snow on runways. *ICAO Circular* (Montreal), 43-AN/38, 1955, 70 p. illus. [Summary of discussion about snow and ice removal at Third North Atlantic Regional Air Navigation Meeting, Montreal, October 1954.]

[Snow and Ice Removal] Note on de-icing of runways, taxiways and aprons at aerodromes, prepared by the Directorate of Air Bases—Technical Services Group Ministry of Public Works, Transport and Tourism, France, November 1951. *ICAO Circular* (Montreal), 43-AN/38, 1955, p. 55–70. [Use of chemical salts.]

AGRICULTURE. FORESTRY. HORTICULTURE

Krylov, G. V. Sokhranim i umnozhim lesnyye bogatstva Sibiri [Let us preserve and enlarge the timber resources of Siberia]. *Priroda* [*Nature*], 1957, No. 3, p. 3–10, illus. [Plans and proposals for better utilization of Siberian forests.]

Goryunova, L. N. Opyt peresadki vzroslykh derev'yev v Murmanskoy oblasti [Experiment in transplanting grown trees in Murmanskaya Oblast']. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of the U.S.S.R. and its Utilization*], Vypusk 1, 1956, p. 70–80, illus. [Experiments in 1950–52.]

P'yavchenko, N. I. Ob usloviyakh proizrastaniya lesa na vostoke Bol'shezemel'skoy tundry [Conditions of forest growth in the eastern part of Bol'shezemel'skaya tundra]. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of the U.S.S.R. and its Utilization*], Vypusk 1, 1956, p. 16–26, illus. [Experimental growth of saplings near northern limit of trees.]

Tikhomirov, B. A. Ob okhrane lesov na ikh severnom predele i o zashchitnom lesorazvedenii v tundre [Preservation of forests at their northern limits and protective tree cultivation in the tundra]. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of the U.S.S.R. and its Utilization*], Vypusk 1, 1956, p. 5–15, illus., map. [Importance to agriculture of encouraging tree growth near northern limit; Soviet experiments.]

Savkina, Z. P., *and* Meshkova, T. P. Opyt posadki zashchitnykh lesnykh polos i izucheniye ikh vliyaniya na mikroklimat v lesotundre [Experimental planting of shelterbelts and study of their influence on micro-climate in wooded tundra]. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of the U.S.S.R. and its Utilization*], Vypusk 1, 1956, p. 80–92, illus. [Progress of experiments at Nar'yan-Mar and Salekhard since 1950.]

Yatchenko, F. I. Sozdaniye zashchitnykh lesnykh polos v tundre na pechorskoy zheleznoy doroge [Planting shelterbelts in tundra along the Pechora railway]. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of the U.S.S.R. and its Utilization*], Vypusk 1, 1956, p. 92–98, illus. [Progress, 1951–54.]

Oswalt, Wendell. Regional chronologies in Spruce of the Kuskokwim River, Alaska. *Anthropological Papers of the University of Alaska*, Vol. 2, No. 2, 1954, p. 203–14, tables, map. [Tree ring sequence compiled from living trees by author, 1953.]

Hare, F. Kenneth, *and* Taylor, Reginald G. The position of certain forest boundaries in southern Labrador—Ungava. *Geographical Bulletin*, No. 8, 1956, p. 51–73, illus [Attempt to define zonal subdivisions of forest by interpretation of aerial photographs French summary p. 71–73.]

Andreyev, V. N. Zaseleniye tundry lesom v sovremennuyu epokhu [Contemporary afforestation of tundra]. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of the U.S.S.R. and its Utilization*], Vypusk 1, 1956, p. 27–45, illus. [Processes by which northern limit of trees advances in north European U.S.S.R.]

Karev, G. I. Kratkaya biologo-ekologicheskaya kharakteristika drevesnykh porod lesotundry vostoka yevropeyskoy chasti SSSR [Short biological and ecological description of trees of the wooded tundra of the eastern part of U.S.S.R. in Europe.] *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of the U.S.S.R. and its Utilization*], Vypusk 1, 1956, p. 61–69, illus. [Characteristics of local species likely to be useful in afforestation near northern limit of trees.]

NORIN, B. N. Osobennosti semennogo vozobnovleniya drevesnykh porod na p-ve Malyy Yamal [Features of seedling growth on Poluostrov Malyy Yamal]. *Rastitel'nost' Kraynego Severa SSSR i yeye Osvoyeniye* [*Vegetation of the Far North of the U.S.S.R. and its Utilization*], Vypusk 1, 1956, p. 46–60, illus. [Factors controlling seedling growth in this area near northern limit of trees, based on observations in 1953–54.]

DOMESTIC ANIMALS. LIVESTOCK

SKALON, V. N. Olennyye kamni Mongolii i problema proiskhozhdeniya olenevodstva [Reindeer stones of Mongolia and the problem of the origin of reindeer husbandry]. *Sovetskaya Arkheologiya* [*Soviet Archaeology*], Tom 25, 1956, p. 87–105, illus. [Significance of carved monuments in Mongolia in showing that domestic reindeer came from Sayan region.]

KRISTIANSEN, UVDLORIÁNGUAQ. Der er i dag 645 rener i Itivnera—. *Atuagagdliutit/Grønlandsposten*, 1956, Nr. 8, p. 5, 17. [Progress of reindeer husbandry in west Greenland, 1952–56; horse-fly problem.]

PORSILD, ALF ERLING. Land use in the Arctic. *Canadian Geographical Journal*, Vol. 48, No. 6, 1954, p. 232–43; Vol. 49, No. 1, 1954, p. 20–31, illus. [Deals mainly with possibility of developing domesticated reindeer industry in Canadian Arctic.]

UTSI, MIKKEL N. P. The future of reindeer in Scotland. *Oryx*, Vol. 4, No. 1, 1957, p. 40–42. [Report by technical adviser to Reindeer Council of Great Britain.]

TAYLOR, ROBERT JULIAN FAUSSITT. The work output of sledge dogs. *Journal of Physiology*, Vol. 137, No. 2, 1957, p. 210–17, illus. [Experiments carried out in Falkland Islands Dependencies, 1954–55, using electrically operated strain gauges to measure pull.]

HUNTING. FISHING

[FISHING INDUSTRY : ARCTIC] Fiskeriinspektørenes virksomhet 1955. *Årsberetning vedkommende Norges Fiskerier*, 1956, Nr. 11 (pub. 1956), 97 p. [Inspectors' reports on all aspects of Norwegian fisheries, including whaling and sealing, 1955.]

[NORTHWEST TERRITORIES : FISHERIES REGULATION] Fisheries act—Northwest Territories fishery regulations, P.C. 1954–1626. *Canada Gazette* (Part 2), November 10, 1954, 6 p. (Reprint.) [Regulations in substitution for special Fishery Regulations for the Northwest Territories, P.C. 3057, 23 June 1950.]

[NORTHWEST TERRITORIES : FISHERIES REGULATION] Fisheries act amendment, Northwest Territories fishery regulations. P.C. 1955–1456. *Canada Gazette* (Part 2), October 12, 1955, 1 p. (Reprint.) [Amendments to Northwest Territories Fishery Regulations P.C. 1954–1626.]

[ICELAND : FISHERIES] *The Icelandic efforts for fisheries conservation. Memorandum submitted to the Council of Europe by the Government of Iceland.* [Reykjavík], Ríkisprentsmiðjan Gutenberg, 1954. 57 p. illus., maps. [Background history and documents relating to Icelandic fisheries dispute.]

[FISHERIES : INTERNATIONAL REGULATION] *Fisheries agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of the Union of Soviet Socialist Republics* [*together with Minute to Article 1 of the Agreement and Exchange of Notes on Territorial Waters*] *Moscow, May 25, 1956.* London, Her Majesty's Stationery Office, 1956. 4 p. (Cmd. 9778.) [Relates to fishing grounds off coast of U.S.S.R. in Barents Sea.]

EINARSSON, HERMANN. Rannsóknir á átu, hitastigi og dreifingu síldar gerðar á rannsóknaskipinu "Ægi" sumarið 1955. *Fjölrit Fiskideildar*, Nr. 7, 1956, 21 p. illus., maps. [Preliminary report on plankton, temperature and herring distribution observations made on research vessel *Ægir* in Iceland waters, summer 1955. English summary.]

RASMUSSEN, BIRGER. Om fløytlinefisket i holstensborgdjupet Vest-Grønland, 1953. *Årsberetning vedkommende Norges Fiskerier*, 1953 (pub. 1957), Nr. 9, p. 85–97, illus. [Float line fishing and general fisheries research off west Greenland, 1953.]

MOSKALENKO, BORIS KONSTANTINOVICH. *Na Pechorskom beregu* [*On the banks of the Pechora*]. Moscow, Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury [State Publishing House for Geographical Literature], 1957. 144 p. illus. 20 cm. [Experiences at fishing, hunting and reindeer-farming collective farms in Nar'yan-Mar area, 1940–44.]

SANDVAER, GERH. Lofotfisket 1956. *Årsberetning vedkommende Norges Fiskerier*, 1956, Nr. 5, (pub. 1957), 95 p. [Official reports on all aspects of Norwegian fisheries at Lofoten grounds, 1956.]

[FISHING INDUSTRY: GREENLAND SEA] Mischreisen von Ostgrönland. *Allgemeine Fischwirtschaftszeitung*, Jahrg. 8, Nr. 40, 1956, p. 2. [Results of German fishing and fisheries research in east Greenland waters, 1955–56.]

HALÅS, MAGNUS. Fiskeforsøk etter feitsild på kystbankene utenfor Trøndelag og Nord-Norge i juni 1953. *Årsberetning vedkommende Norges Fiskerier*, 1953 (pub. 1957), Nr. 9, p. 20–23, illus. [Experimental fishing for herring, Norwegian and Barents Seas, June 1953.]

WHALING AND SEALING INDUSTRIES

RUUD, JOHAN T. Internasjonal regulering av hvalfangsten: et tilbakeblikk og en vurdering. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 7, 1956, p. 374–87. [Evaluates international regulation of whaling. In Norwegian and English.]

[WHALING : INTERNATIONAL REGULATIONS] "Olympic Challenger" har ikke overholdt bestemmelsene i Den Internasjonale Hvalfangstkonvensjon. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 1, 1956, p. 1–37. [Norwegian and English text of papers (November–December 1955) concerning *Olympic Challenger*'s alleged infringement of International Whaling Convention provisions; facsimile of part of documentary evidence.]

[WHALING : INTERNATIONAL REGULATIONS] "Olympic Challenger"s fangst og bestemmelsene i Den Internasjonale Hvalfangstkonvensjon. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 4, 1956, p. 172–208, illus. [Norwegian and English text of further papers (February 1956) and documentary evidence concerning *Olympic Challenger*'s alleged infringement of International Whaling Convention provisions; see *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 1, 1956.]

[WHALING CONFERENCES] Det 7. møte i Den Internasjonale Hvalfangstkommisjon. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 3, 1956, p. 113–27. [Proceedings at 7th meeting of International Whaling Commission, Moscow, 1955. In Norwegian and English.]

MIYAZAKI, ICHIRO. Oversikt over hvalfangsten fra landstasjoner i Japan i 1955. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 5, 1956, p. 252–54, 257, 259–60, 263–64, illus. [Whaling from land stations in Japan, 1955. Zoological-statistical emphasis. In Norwegian and English.]

[WHALING : ANTARCTIC] Expansion of Russian and Japanese whaling. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 11, 1956, p. 608–10. [Prospects of antarctic whaling. In Norwegian and English.]

[WHALING INDUSTRY : ANTARCTIC] Skyggene over en særpreget norsk næring. *Hvalfangstliv*, Årg. 17, Nr. 1–2, 1956, Årsrevy 1956, p. 15, 17, 19, 28. [Editorial on decline of Norwegian whaling industry.]

GOLODNOFF, M. Den store savssat. *Grønland*, 1956, Nr. 7, p. 269–80, illus. [Catching White Whales (*Delphinapterus leucas*) trapped in ice crack (Vaigat, west Greenland).]

TRANSPORT AND POSTAL SERVICES

GARDNER, GÉRARD. Quelques aspects de la mise en valeur du Grand-Nord. 1. Le développement des transports au Yukon. *Actualité Économique* (Montreal), 32e Année, No. 4, 1957, p. 581–603, maps. [Review of existing and proposed lines of communication in Yukon and north-west Canada.]

HERBERT, C. H. The development of transportation in the Canadian north. *Canadian Geographical Journal*, Vol. 53, No. 5, 1956, p. 188–208, illus., map. [History, difficulties and prospects.]

WESTPHALL, POVL. Greenland in the age of technical science. *In*: BURE, Kristjan, *ed. Greenland. 3rd ed.* [Copenhagen], Royal Danish Ministry for Foreign Affairs, [1956?], p. 161–69, illus. [Recent development of shipping and flying to and in Greenland.]

[GREENLAND : SAILING DIRECTIONS] *Dansk fyrliste. Fyr- og tågesignalstationer samt radiofyr. Danmark, Færøerne og Grønland. Toogtyvende udgave*, København, Det Kongelige Søkort-Arkiv, 1956. 321 p. map. 25½ cm. [22nd edition of Danish list, with details, of lights, fog signal stations and wireless beacons, including Greenland and Faroe Islands.]

BLACK, W. A., *compiler*. Extracts relating to the navigability of Canadian inland waterways. *Canada. Department of Mines and Technical Surveys. Geographical Branch. Geographical Paper*, No. 7, 1956, 55 p. (Miscellaneous papers series). [List of rivers and lakes alphabetically arranged with extracts from published works on navigability. Based on research for new waterways atlas.]

BROCHU, MICHEL. Problèmes et possibilités de la navigation d'hiver sur le Saint-Laurent. *Revue Canadienne de Géographie*, Vol. 10, No. 4, 1956, p. 191–200, maps. [Problems and possibilities of winter navigation of St Lawrence River.]

LYNGE, LARS. Har privatflyvning en fremtid i Grønland? *Atuagagdliutit/Grønlandsposten*, 1956, Nr. 11, p. 5–6. [Possibilities of private commercial flying in Greenland; route and budget proposals.]

[ANTARCTIC : AIR TRANSPORT] First commercial flight to Antarctica. *Explorers Journal*, Vol. 35, No. 1, 1957, p. 18–19, illus. [By Chilean National Airlines to Graham Land and back, December 1956.]

BUILDING CONSTRUCTION

NÄSLUND, BERTIL. *Vinterbygge—en kostnadsstudie.* Stockholm, Statens Nämnd för Bygg nadsforskning, 1955. 227 p. illus. 24 cm. 10 *Sw.Kr.* (Statens Nämnd för Byggnads forskning, Handlingar Nr. 26.) [Building construction in winter: a cost study. Englis summary.]

NÄSLUND, BERTIL. Winter construction. *National Research Council of Canada, Technica Translation* TT-583, 1955, 64 leaves, illus. [Adaptation of building techniques to con ditions in Sweden. Translated from *Statens Kommitté for Byggnadsforskning, Stockholm Broschyr* 5, 1952, 32 p.

BÄHRNER, V. *Betonggjutning vintertid.* Stockholm, Svenska Cementföreningen, 1955. 37 p illus. 22½ cm. 2 *Sw.Kr.* [Summary of information on winter concreting. Bibliography.

LÉVY, JEAN-PIERRE. The pathology of construction: the causes of cracking of concrete *National Research Council of Canada, Technical Translation* TT-574, 1955, 18 leaves illus. [Includes precautions to be taken against cracking by frost and ice. Translate from *Bâtir*, 42, 32–37, 1954.]

MCNEESE, DONALD C. Early freezing of non-air-entraining concrete. *Journal of the America Concrete Institute*, Vol. 24, No. 4, 1952, p. 293–300, illus. [Critical period when fres concrete is damaged by freezing considered.]

THE ARTS. ARCHITECTURE. ENTERTAINMENT. RECREATION

HOUSTON, JAMES A. The creation of Anoutoaloak. *Beaver*, Outfit 286, Winter 1955, p. 50 53, illus. [Mace made by Eskimo craftsmen for Governor General of Canada.]

[SOVIET ARCTIC : TOWNS] Life in the Arctic. Facts and figures. *Soviet Union* (Moscow No. 6 (88), 1957, p. 34–35, illus. [Pictures of Vorkuta, Magadan, Noril'sk.]

MIKKELSEN, EJNAR. Scoresbysund kolonien 1924–55. *Grønland*, 1956, Nr. 3, p. 81–91 illus. [Scoresbysund settlement, east Greenland, 1924–55.]

ROSENDAHL, G. P. Anlægsarbejder i Thule 1954. *Atuagagdliutit/Grønlandsposten*, 1956 Nr. 5, p. 3–6, 22, illus., map. [Town plan, and building operations in 1954, at ne settlement of Thule (former Qanaq) in Inglefield Bredning, north-west Greenland.]

ROBERTSON, R. GORDON. Aklavik—a problem and its solution. *Canadian Geographica Journal*, Vol. 50, No. 6, 1955, p. 196–205, illus., map. [Canadian Arctic. Reasons fo re-siting of town.]

BIRD, JOHN BRIAN, *and* BIRD, M. BERYL. Notes on potential building sites in the Bathurs Inlet area, N.W.T. *Canada. Department of Mines and Technical Surveys. Geographica Branch. Geographical Paper*, No. 8, 1957, 14 p. map. (Miscellaneous papers series [Analyses 8 sites in northern half of inlet.]

[NORIL'SK] V Noril'ske [In Noril'sk]. *Geografiya v Shkole* [*Geography in School*], 1957, No. p. 62–63. [Recent growth of mining town in Soviet Arctic.]

ORLOVA, VALENTINA. On the fringe of Siberia. "I never imagined it was like this." *Sovi Union*, No. 11 (81), 1956, p. 10–11, illus. [Photographs showing growth of Noril'sk.]

THOMSEN, RUDI. Grønlandske medailleminder. *Grønland*, 1957, Nr. 1, p. 1–10, illu [Medals to commemorate Greenland exploration.]

[POLAR MEDAL] [Awards of the Polar Medal.] *London Gazette*, No. 40421, 1 March, 195 p. 1269. [Award of Polar Medal to members of Falkland Islands Dependencies Survey 1949–54, and to Australian members of French Antarctic expeditions in 1951 and 1952

[POLAR MEDAL] [Award of Polar Medal to members of advance party of Royal Societ Antarctic Expedition for the International Geophysical Year]. *London Gazette*, N 41113, 28 June 1957, p. 3878.

POUCHER, W. A. Mountain photography. *Mountain Craft*, No. 23, 1954, p. 2–7, illu [General technique and equipment.]

STOBART, T. R. Filming the Everest expedition. *Mountain Craft*, No. 24, 1954, p. 3–6, 1 illus. [Equipment, technique, and difficulties to be overcome.]

BILLING, GILLIS. Fjällsport på Spetsbergen. *På Skidor*, 1956, p. 61–79, illus. [Account Austrian mountaineering expedition (leader H. Gsellmann) to Krossfjorden area, nort west Vestspitsbergen, 1954, by Swedish member.]

BORENIUS, GUSTAF. Bestigningar 1955. *Till Fjälls*, Årg. 27, 1955 (pub. 1956), p. 62–6 [Summary and list of mountain ascents in 1955 by Swedes (date, climbers, conditions including north Scandinavia.]

BAUME, LOUIS. The South Georgia Survey, 1955–56. *Alpine Journal*, Vol. 61, No. 29 1957, p. 465–71, illus., map (folding facing p. 466). [Mountaineering by expeditio members, leader V. D. Carse.]

[Ski-ing] *Handbook on ski-touring and glacier ski-ing 1954.* London, Ski Club of Great Britain, 1954. [81] p. illus. 15 cm. 4*s.* 6*d.* [Includes undated supplement on new method of crevasse rescue.]

Spickett, S. G. The equipment of the ski mountaineer. *Mountain Craft*, No. 26, 1955, p. 18–19, illus. [Type of skis, sticks, boots and skins necessary.]

Wright, J. E. B. The care and use of crampons and the ice-axe. *Mountain Craft*, No. 23, 1954, p. 18–19, illus.

Riddell, James. *Dog in the snow.* London, Michael Joseph, 1957. 144 p. illus. 22½ cm. 12*s.* 6*d.* [Account, by Chief Instructor, of Middle East Ski School (part of Middle East Mountain Warfare School), Lebanon, 1941–44. Life of Alsation "Rex" at the school.]

EXPEDITIONS. HISTORY OF EXPLORATION

Balchin, W. G. V. *Financial aids to geographical research: a memorandum prepared for the Research Committee of the Royal Geographical Society.* London, Royal Geographical Society, 1954. 16 p. [List of aid-granting institutions.]

Arctic

Bushnell, Vivian C. Marvin's ice shelf journey, 1906. *Arctic*, Vol. 9, No. 3, 1956, p. 166–77, port., map. [Comments on and text of Ross G. Marvin's report on trip along ice front of north coast of Ellesmere Island, 1906, while member of Peary's expedition of 1905–06. Includes soundings through sea ice.]

Yevgenov, N. I. Gidrograficheskaya ekspeditsiya v severnom ledovitom okeane na sudakh "Taymyr" i "Vaygach" (1910–1915) [Hydrographic expedition in the Arctic Ocean in the "Taymyr" and "Vaygach" (1910–15)]. *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva* [*News of the All-Union Geographical Society*], Tom 89, Vypusk 1, 1957, p. 14–24, map. [Narrative.]

Dunbar, Maxwell John. The *Calanus* expeditions in the Canadian Arctic, 1947 to 1955. *Arctic*, Vol. 9, No. 3, 1956, p. 178–90, illus., map. [Scope of annual Fisheries Research Board of Canada expeditions outlined and results summarised: oceanography; fishes; marine mammals; zoogeography; plankton.]

Malaurie, Jean. *The last kings of Thule: a year among the polar Eskimos of Greenland. Translated by Gwendolen Freeman, with a preface by G. de Poncins.* London, George Allen and Unwin, 1956. 296 p. illus., maps. 22 cm. 21*s.* [English edition of *Les derniers rois de Thulé* (Paris, Plon, 1955).]

Simpson, Cortlandt James Woore. *North ice: the British North Greenland Expedition.* London, Hodder and Stoughton, 1957. 384 p. illus., maps. 22½ cm. 37*s.* 6*d.* [Leader's account of 1952–54 expedition, with appendices. Reviewed by A. Stephenson, *Geographical Journal*, Vol. 123, Part 2, 1957, p. 250–51.]

Baird, Patrick Douglas. Cumberland Peninsula of Baffin Island. *Canadian Geographical Journal*, Vol. 48, No. 3, 1954, p. 88–97, illus., map. [Leader's account of 1953 expedition.]

[Expeditions : Arctic] Oxford University West Spitsbergen Expedition, 1953. *Oxford University Exploration Club Bulletin*, No. 6, 1954, p. 19–22. [General account; leader, I. F. Davidson.]

Tennant, W. The British Ny Friesland Expedition, 1954. *Mountain Craft*, No. 28, 1955, p. 6–7, illus. [Narrative.]

Negri, N. C. *The valley of shadows: the story of an arctic expedition.* London, Muller, [c1956]. vii, 196 p. illus., maps. 20 cm. 16*s.* [Lyngen Peninsula. Leader's narrative of Winter Survey Expedition, 1954–55. Reviewed by A. M. Savours, *Geographical Journal*, Vol. 123, Part 2, 1957, p. 252.]

Yatsun, Yevgeniy Pavlovich. *Na l'dine cherez polyus. Zapiski kinooperatora* [*Across the Pole on an ice floe. A cameraman's notes*]. Moscow, Izdatel'stvo TsK VLKSM "Molodaya Gvardiya" [Publishing House of the Central Committee of the Komsomol "Molodaya Gvardiya"], 1957. 253 p. illus. 20½ cm. [Narrative of Soviet drifting station SP-3 in Arctic Ocean, 1954–55.]

Hollin, John. Oxford University expedition to North East Land 1955. *Oxford University Exploration Club Bulletin*, No. 8, 1957, p. 13–19, map. [Leader's report. Details of organization of expedition, particularly of finance.]

Schytt, Valter. Med en rysk expedition i Arktis. *Ymer*, Årg. 77, Hft. 1, 1957, p. 19–38, illus. map. [Soviet oceanographical research expedition in *Ob'* in Arctic Ocean, August–September 1956, (leader L. L. Balakshin), accompanied by author. English summary.]

Gakkel', Ya. Ya. Vysokoshirotnaya okeanograficheskaya ekspeditsiya v severnuyu chast' Grenlandskogo morya [High latitude oceanographical expedition to the northern part of the Greenland Sea]. *Morskoy Flot* [*Merchant Fleet*], 1957, No. 3, p. 25–27. [Narrative of expedition in *Ob'*, 1957.]

LILJEQUIST, GÖSTA H. Den svensk-finsk-schweiziska expeditionen till Nordostlandet 1957–58. En översikt av planerade arbeten och undersökningar. *Kosmos* (Stockholm) Bd. 34, 1956, p. 15–32, map. [Plans for Swedish–Finnish–Swiss International Geophysical Year expedition to Nordaustlandet, Spitsbergen, 1957–58.]

CASWELL, JOHN EDWARDS. *Arctic frontiers: United States explorations in the far north* Norman, University of Oklahoma Press, [c1956]. xvi, 232 p. illus., maps. 22 cm. $3.75. [History, 1850–1909.]

SØRENSEN, JANUS. Den arktiske forsknings pionerer. *Grønland*, 1956, Nr. 6, p. 201–16, illus. ports. [Danish translation of extract from *Down in the north* (Air University, Alabama 1953) on arctic exploration, with outline of Danish contribution to Greenland exploration.]

MARSHALL, ROBERT. *Arctic wilderness. Edited, with an introduction, by George Marshall. Foreword by A. Starker Leopold.* Berkeley and Los Angeles, University of California Press, 1956. xxvi, 171 p. illus., map (folding at end). 23½ cm. $3.75. [Author's journals of four visits to Alaska especially Brooks Range, 1929–39. Reviewed by George Gryc in *Arctic*, Vol. 8, No. 4, 1955, p. 253–54.]

BELOV, M. I. Russkiye pokhody na Kamchatku do Atlasova [Russian journeys to Kamchatka before Atlasov]. *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva* [*News of the All-Union Geographical Society*], Tom 89, Vypusk 1, 1957, p. 25–35. [Newly found archive evidence of journeys to Kamchatka in late seventeenth century.]

GVOZDETSKIY, NIKOLAY ANDREYEVICH. *Sorok let issledovaniy i otkrytiy* [*Forty years of exploration and discovery*]. Moscow, Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury [State Publishing House for Geographical Literature], 1957. 208 p. illus. maps. 20 cm. [Popular account of major Soviet geographical discoveries in Soviet Arctic and adjacent seas since 1917.]

BURKHANOV, V. F., *ed. Cherez okean na dreyfuyushchikh l'dakh* [*Across the ocean on drifting ice*]. Moscow, Gosudarstvennoye Izdatel'stvo Geograficheskoy Literatury [State Publishing House for Geographical Literature], 1957. 384 p. illus., maps. 20 cm. [Collected narratives of Soviet drifting stations in Arctic Ocean, from SP-1 (1937–38) to SP-5 (1955–56).]

BURKHANOV, V. F. Sovetskiye issledovaniya arktiki [Soviet investigations of the Arctic]. *Priroda* [*Nature*], 1957, No. 5, p. 21–30, illus., maps. [Significance of observations mainly in oceanography and geology, made at Soviet drifting stations in Arctic Ocean 1954–56.]

MOROZOV, SAVVA TIMOFEYEVICH. *U poslednikh paralleley. Na dreyfuyushchikh l'dakh okeana* [*At the last parallels. On the drifting ice of the ocean*]. Moscow, Voyennoye Izdatel'stvo Ministerstva Oborony Soyuza SSR [Military Publishing House of the Ministry of Defence of the U.S.S.R.], 1956. 246 p. illus. 20 cm. [Journalist's account of Soviet investigation of central polar basin, chiefly since 1948.]

Antarctic

[ANTARCTIC : HUTS] United States discoveries in Antarctica, 1956. *Geographical Journal* Vol. 122, Part 4, 1956, p. 527, illus. [Interior photograph of hut built by R. F. Scott on Cape Evans, 1911, and discovered by United States Antarctic expedition, 1956.]

[EXPEDITIONS : ANTARCTIC] Shackleton's Imperial Transantarctic expedition. *Geographical Journal*, Vol. 121, Part 3, 1955, p. 373–74. [Commemoration of marooning of men of Ross Sea Party on 6 May, 1915, when *Aurora* broke her moorings. Correction, *ibid.* Vol. 122, Part 2, 1956, p. 285.]

MCNEISH, HAROLD. An "Endurance" diary. *Antarctic News Bulletin*, No. 11, 1953, p. 74–75; No. 12, 1953, p. 88–90; No. 13, 1954, p. 103–05; No. 14, 1954, p. 116–17; No. 15, 1954, p. 126–27; No. 16, 1954, p. 146–47; No. 17, 1955, p. 174–75; No. 20, 1955, p. 14–15. [Text of diary kept during the British Imperial Trans-Antarctic Expedition, 1914–17. Incomplete.]

DARLINGTON, JENNIE, *Mrs. My antarctic honeymoon: a year at the bottom of the world, as told to Jane McIlvaine, illustrated by Peter Spier.* New York, Doubleday, 1956. 284 p. illus., maps (on end papers). 22 cm. $3.95. [Narrative of Ronne Antarctic Research Expedition, 1947–48.]

FRÖDIN, BERTIL. *Den okända kontinenten.* Stockholm, Bonnier, 1956. 248 p. illus., maps. 22½ cm. 23.50 *Sw.Kr.* [Chilean antarctic expeditions 1951 and 1953, of which author was member; introductory survey of antarctic exploration; political situation in Antarctic.]

HEANEY, JOHN B. Manhauling in South Georgia. *Visa*, (Cambridge), Vol. 1, No. 1, 1955 p. 12–17, maps. [Surveyor's account of South Georgia Survey, 1951–52, leader, Duncan Carse.]

DOVERS, ROBERT. *Huskies.* London, Bell, 1957. 219 p. illus., maps. 22½ cm. 21*s.* [Australian observer's narrative of expedition led by Mario Marret, Expéditions Polaires Françaises, Terre Adélie, 1951–52. Emphasis on dogs.]

ANDERSON, WILLIAM ELLERY. *Expedition south.* London, Evans Brothers, 1957. 208 p. illus., maps. 23 cm. 18*s*. [Narrative of life and work at the Falkland Islands Dependencies Survey station at Hope Bay, 1955–56.]

HOLDGATE, MARTIN W. Gough Island. *Geographical Magazine*, Vol. 29, No. 9, 1957, p. 423–35, illus., maps. [Well illustrated account of 1955–56 expedition to Gough Island with brief history of the island.]

DIAZ, EMILIO L. La compaña antártica 1955–56. *Anales de la Sociedad Científica Argentina*, Tomo 162, Sept.–Oct. 1956, E. III y IV, p. 63–88. (Reprinted as *Contribución del Instituto Antártico Argentino*, No. 11.) [Outline of Argentine activities in Antarctica.]

MOTT, P. G. Aerial surveyors in Graham Land. *Geographical Magazine*, Vol. 29, No. 8, 1956, p. 397–404, illus., map. [Leader's account of work of Falkland Islands and Dependencies Aerial Survey Expedition, 1955–56.]

[EXPEDITIONS : ANTARCTIC] *New Zealand antarctic manual 1956–1958, Scott Base, Ross Dependency.* Wellington, (New Zealand), Ross Sea Committee, [1957]. 92 leaves. 27 cm. [Rules for conduct of Commonwealth Trans-Antarctic Expedition, Scott Base.]

LOWE, GEORGE. The British Transantarctic Expedition. *Journal of the Institute of Navigation*, Vol. 10, No. 2, 1957, p. 161–67, illus., maps. [Narrative and aims, 1955–56.]

STEWART, R. H. A. The hazards of Antarctica. *Geographical Magazine*, Vol. 30, No. 5, 1957, p. 243–47, illus., map. [Establishment of Commonwealth Trans-Antarctic Expedition's Shackleton Base: account by member of advance party.]

SIPLE, PAUL ALLMAN. We are living at the South Pole. *National Geographic Magazine*, Vol. 112, No. 1, 1957, p. 5–35, illus., map. [Establishment and working of U.S. station for the International Geophysical Year at South Pole, 1956.]

[EXPEDITIONS : ANTARCTIC] Operation Deepfreeze: a seaborne invasion of the Antarctic. *United States Naval Institute Proceedings*, Vol. 83, No. 3, 1957, p. 300–14, illus., map. [Photographs of 1955–56 phase.]

FORSYTH THOMPSON, P. R., *and* WILLIS, M. A. The Royal yacht sails in. I. Visit to Tristan, by P. R. Forsyth Thompson. II. From island to island, by M. A. Willis. *Corona*, Vol. 9, No. 6, 1957, p. 213–18. [Visit of Royal Yacht *Britannia* to Falkland Islands, South Georgia, Tristan da Cunha and Gough Island, January 1957.]

ART AND TECHNIQUE OF LIFE AND TRAVEL IN COLD REGIONS

PLUMPTON, ERIC. Equipment for summer arctic expeditions. *Oxford University Exploration Club Bulletin*, No. 8, 1957, p. 20–25. [Lists food and equipment.]

VON GREYERZ, WALO. Enmansigloo i tunt snötäcke. *Svenska Turistföreningens Tidning*, 1956, Nr. 2, p. 53–54, illus. [Technique of building one-man igloo in emergency, with only thin snow cover.]

WEIR, TOM. Arctic survey. *Mountain Craft*, No. 21, 1953, p. 2–5, illus. [Equipment and training needed for summer surveying parties in Norwegian Arctic.]

[SURVIVAL] *Survival training in the USAF.* Alabama, Arctic, Desert, Tropic Information Center, Air University, Maxwell Air Force Base, [195?] [16] p. illus. 22 cm. (Reprinted from *Air University Quarterly Review*, Vol. 5, No. 4, [195?], p. 71–84. [Includes technique of polar survival.]

SHACKLETON, PHIL. School for survival. *Canadian Geographical Journal*, Vol. 48, No. 4, 1954, p. 144–49, illus. [Arctic survival course for Royal Canadian Air Force crews.]

BIOGRAPHY

WESTPHALL, POVL. En luftens viking lægger op. *Grønland*, 1957, Nr. 1, p. 29–33, illus. [Biographical note and appreciation of Bernt Balchen on occasion of retirement from United States Air Force.]

[BIOGRAPHY] Svend Foyn Bruun. *Norsk Hvalfangst-Tidende*, Årg. 45, Nr. 6, 1956, p. 293–95, port. [Obituary of Norwegian shipping owner and whaling entrepreneur. In Norwegian and English.]

GROSVENOR, MELVILLE BELL. Admiral of the ends of the earth. *National Geographic Magazine*, Vol. 112, No. 1, 1957, p. 36–48, illus. [Obituary of Richard Evelyn Byrd.]

BEAGLEHOLE, J. C. On the character of Captain James Cook. *Geographical Journal*, Vol. 122, Part 4, 1956, p. 417–29, illus. [Based on new or little-known sources.]

COURTAULD, AUGUSTINE. *Man the ropes.* London, Hodder and Stoughton 1957. 188 p. illus., map (on end papers). 19 cm. 12*s*. 6*d*. [Autobiography.]

LAMB, G. F. *Franklin, happy voyager; being the life and death of Sir John Franklin.* London, Ernest Benn, 1956. 293 p. illus., map, 22 cm. 35*s*. [Biography based on printed sources. Reviewed by R. J. Cyriax, *Geographical Journal*, Vol. 123, Part 1, 1957, p. 101–02.]

LAURSEN, DAN. Grønlændere i forskningens tjeneste II: *Hans Hendrik* fra Fiskenæsset. *Grønland*, 1956, Nr. 4, p. 144–49, port. [Biographical note on Greenlander who took part in several nineteenth-century American and British arctic expeditions.]

JACK, ROBERT. *Arctic living: the story of Grimsey*. London, Hodder and Stoughton, 1957. 181 p. map, 20 cm. 12*s*. 6*d*. [Life as pastor on the island since 1947. First published by Ryerson Press, Toronto, 1955.]

THORSON, GUNNAR. Adolf S. Jensen 23. maj 1866–29. august 1953. Mindetale ved Dansk Naturhistorisk Forening's møde den 9. oktober 1953. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening*, Bd. 116, 1955, p. v–xviii, ports. [Obituary of Danish zoologist. Complete bibliography.]

[LEVICK, GEORGE MURRAY.] Commander G. Murray Levick, R.N. *Geographical Journal*, Vol. 122, Part 3, 1956, p. 405–06. [Obituary.]

LARSEN, HELGE. Æresformand i det Grønlandske Selskab. *Grønland*, 1956, Nr. 3, p. 120, port. [Tribute to Ejnar Mikkelsen, Honorary President (ex-President) of det Grønlandske Selskab.]

MUIR, JOHN. *The wilderness world of John Muir, with an introduction and interpretive comments by Edwin Way Teale*. Boston, Houghton Mifflin, [c1954]. xx, 322 p. illus. 21 cm. $4.50. [Extracts from Muir's published books, including "Travels in Alaska" and "Stickeen".]

CYRIAX, R. J., *and* JONES, A. G. E. The papers in the possession of Harry Peglar, Captain of the Foretop, H.M.S. *Terror*, 1845. *Mariner's Mirror*, Vol. 40, No. 3, 1954, p. 186–95. [Details of manuscripts, now in National Maritime Museum, found on body of one of victims of Franklin expedition, 1845–48.]

BARNE, MICHAEL. Engineer Vice-Admiral Sir Reginald Skelton, K.C.B., C.B.E., D.S.O., R.N. *Geographical Journal*, Vol. 122, Part 4, 1956, p. 533–34. [Obituary.]

ARCTIC REGIONS IN GENERAL

DALGÅRD, SUNE. *Det Petsoriske Kompagni af 1619*. København, Munksgaard, 1955. 104 p. 19½ cm. 12 *D.Kr*. [The Danish trading company, 1619–22. English summary.]

[WILD LIFE PROTECTION: ARCTIC] Threats to arctic animals: international measures needed for preservation. *Oryx*, Vol. 3, No. 1, 1955, p. 25–28. [Impact of increasing economic development on fauna.]

Greenland

BURE, KRISTJAN., *ed. Greenland. 3rd ed.* [Copenhagen], Royal Danish Ministry for Foreign Affairs, [1956?]. 169 p. illus., maps. 22½ cm. [Ten chapters by different authorities on various aspects of Greenland. Two more articles added to first, 1952, edition.]

IVERSEN, MOGENS. Biblioteker i Grønland. *Grønland*, 1956, Nr. 8, p. 295–99, illus. [Plans for public library service in Greenland.]

FELBO, JØRGEN. Grønland i den danske presse. *Grønland*, 1956, Nr. 5, p. 179–84, illus. [Treatment of Greenland in Danish press.]

GALSTER, JULIUS. Grønlandsk husflid: fremstilling, salg og fremtidsmuligheder. *Grønland*, 1956, Nr. 8, p. 281–88, illus. [Greenland handicrafts; production, sale and future prospects.]

MØLLER, J. KISBYE. Fire år under det nye retssystem. *Grønland*, 1956, Nr. 5, p. 161–72, illus. [Judicial system in Greenland since law of 1951.]

MØLLER, J. KISBYE, *and* LARSEN, VIGGO S. Grønlands landsrets cirkulæresamling I. Kommentar til den grønlandske retsplejelov af 14 juni 1951 med senere ændringer, formularer m.m. *Beretninger vedrørende Grønland*, 1955, Nr. 5, 98 p. [Commentary on, and revisions of, Greenland Administration of Justice Act of 14 June, 1951. Originally issued as 30 circulars by Greenland chief justice, here revised and rearranged.]

VESTERBIRK, CHARLES. Hvordan en politimand i Grønland ser på retshåndhævelsens problemer. *Grønland*, 1956, Nr. 8, p. 307–16, illus. [Law enforcement problems in Greenland.]

GAM, M. Går der en klar linje gennem den grønlandske skoles opbygning? *Grønland*, 1956, Nr. 6, p. 227–34, illus. [Principles behind building up Greenland school system.]

JEGIND, AAGE. Den grønlandske lærlingeuddannelse i Danmark. *Grønland*, 1956, Nr. 5, p. 189–99, illus. [Training of Greenlander apprentices in Denmark since 1837; modern organization of training.]

LUND, KAJ BUDDE. Nogle problemer vedrørende fri handel i Grønland. *Grønland*, 1956, Nr. 1, p. 1–12, illus. [Monopoly and free trade in Greenland; respective merits and drawbacks.]

GALSTER, J. Kan de grønlandske vandfald udnyttes industriellt? *Grønland*, 1956, Nr. 1, p. 20–26, illus. [Waterfalls in Greenland; possibilities of industrial use.]

North American Arctic

BERTON, PIERRE. *The mysterious north.* London, Cassell, 1956. [xiv, 361] p. illus., maps. 22 cm. 25*s*. [Author's memoirs of life in North American Arctic.]

[NORTH AMERICAN ARCTIC : DEFENCE] Agreement between Canada and the United States on the establishment of a Distant Early Warning system in Canadian territory. *Arctic Circular*, Vol. 9, No. 2, 1956, p. 23–31. [Terms of 1955 agreement.]

MARSHALL, C. J. North America's Distant Early Warning Line. *Geographical Magazine*, Vol. 29, No. 12, 1957, p. 616–28, illus., map. [Its construction, 1955–57.]

[NORTHWEST TERRITORIES : LAWS] *The House of Commons of Canada. Bill 77. An act to amend the acts respecting the Northwest Territories. As passed by the House of Commons 22nd January 1954.* Ottawa, Queen's Printer, 1954. 13 p. 25 cm. (1st Session, 22nd Parliament, 2 Elizabeth II, 1953.) [Amendments to Northwest Territories Act, Chapter 195, Revised Statutes of Canada, 1952, and Northwest Territories Act, Chapter 331, Revised Statutes of Canada, 1952.]

WHITHAM, K., *and* LOOMER, E. I. A comparison of magnetic disturbance at Resolute Bay and Baker Lake, Canada. *Tellus*, Vol. 8, No. 2, 1956, p. 267–78, illus.

MACKAY, J. ROSS. Mackenzie deltas—a progress report. *Canadian Geographer*, No. 7, 1956, p. 1–12, illus., maps. [Report on old and recent deltaic deposits and channels in the area.]

BIAYS, PIERRE. *Conditions et genres de vie au Labrador septentrional.* Québec, Presses Universitaires Laval, 1955. 35 p. illus., maps. 25½ cm. (*Université Laval. Publications de l'Institut de Géographie*, 6). [Conditions of existence of native population; economic improvements suggested.]

KEMP, H. S. M. *Northern trader.* New York, Bouregy and Curl, [c1956]. 253 p. 21 cm. $3.50. [Author's experiences in Saskatchewan, 1908–47. Reviewed by R. B. Horsefield, *Beaver*, Outfit 287, Summer 1956, p. 56.]

[CANADA : LAWS] *1–2 Elizabeth II. Chap. 53. An act to provide for the government of the Yukon Territory. Assented to 14th May 1953.* Ottawa, Queen's Printer, 1953. 19 p. 24½ cm. (p. 419–37, reprint). [Text of Yukon Act.]

[NORTHWEST TERRITORIES : LAWS] *2–3 Elizabeth II. Chap. 8. An act to amend the acts respecting the Northwest Territories.* Ottawa, Queen's Printer, 1954. 6 p. 25 cm. [Amendments to Northwest Territories Act, chapter 195, Revised Statutes of Canada, 1952.]

Soviet Arctic

POKSHISHEVSKIY, VADIM VYACHESLAVOVICH. *Yakutiya. Priroda—lyudi—khozyaystvo* [*Yakutiya. Nature, people, economy*]. Moscow, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Sciences of the U.S.S.R.], 1957. 200 p. illus., maps. 20 cm. [Outline of economic geography.]

LLOYD, TREVOR. The Norwegian–Soviet boundary. A study in political geography. *Norsk Geografisk Tidsskrift*, Bd. 15, Hft. 5–6, 1955–56 (1956, Nr. 1–2), p. 187–242, illus., maps. [History, geography, politics, economics, demography, of area.]

[YAKUTSKAYA A.S.S.R.] *Sakha Avtonomnay Sovetskay Sotsialisticheskay Respublikatyn Konstitutsiyata* (*Tfrut sokuona*) [*Constitution (basic law) of the Yakut Autonomous Soviet Socialist Republic*]. Yakutsk, Sakha Sirineebi Kinige Izdatel'stvata [Yakut Book Publishing House], 1955. 48 p. 20 cm. [Text in Yakut and Russian.]

ÖHBERG, ARNE. Russia and the world market in the seventeenth century: a discussion of the connection between prices and trade routes. *Scandinavian Economic History Review*, Vol. 3, No. 2, 1955, p. 123–62, illus. [Particularly Archangel and White Sea trade.]

SAFRONOV, FEDOT GRIGOR'YEVICH. *Dekabristy v yakutskoy ssylke* (*k 130-letiyu so dnya vosstaniya dekabristov*) [*Decembrists in Yakut exile (on the 130th anniversary of the December rising)*]. Yakutsk, Yakutskoye Knizhnoye Izdatel'stvo [Yakutsk Book Publishing House], 1955. 82 p. illus. 22 cm. [Exile of 9 participants of rising in December 1820; poems and stories by N. A. Chizhov and A. A. Bestuzhev-Marlinskiy about their place of exile.]

YURCHENKO, A. V. The liquidation of the Karelo–Finnish SSR. *Bulletin of the Institute for the Study of the U.S.S.R.* (Munich), Vol. 3, No. 10, 1956, p. 28–32. [Background to Soviet law of 16 July 1956 changing Karelo-Finskaya S.S.R. into Karel'skaya A.S.S.R.]

LASHUK, L. P. Etnicheskaya istoriya pechorskogo kraya [Ethnic history of the Pechora region.] *Akademiya Nauk SSSR. Institut Etnografii imeni N. N. Miklukho-Maklaya. Kratkiye Soobshcheniya.* [*Academy of Sciences of the U.S.S.R. N. N. Miklukho-Maklay Institute of Ethnography. Short Communications*], No. 25, 1956, p. 82–91. [Movements of various ethnic groups into and out of this area since 2nd millennium B.C.]

SIVKOV, K. V., *ed., and others. Ocherki po istorii Komi ASSR. Tom 1.* [*Outlines in the history of Komi A.S.S.R. Tom 1.*] Edited by K. V. Sivkov, A. A. Zimin, L. I. Surina. Syktyvkar, Komi Knizhnoye Izdatel'stvo [Komi Book Publishing House], 1955. 351 p. illus., maps. 23 cm. [Up to 1917.]

BELOV, M. I. *Arkticheskoye moreplavaniye s drevneyskikh vremen do serediny XIX veh* [*Arctic seafaring from ancient times to the middle of the 19th century*]. Moscow, Izdatel'stv "Morskoy Transport" ["Morskoy Transport" Publishing House], 1956. 592 p. illus maps. 26 cm. (Istoriya otkrytiya i osvoyeniya severnogo morskogo puti [History o the discovery and mastery of the Northern Sea Route], Tom 1). [Detailed account fro original sources. First volume of four.]

Scandinavia (Denmark, Finland, Iceland, Norway and Sweden)

RUONG, ISRAEL. Nordisk samekonferens i Karasjok. *Samefolkets Egen Tidning*, Årg. 3 Nr. 3, 1956, p. 4–5. [Second inter-Scandinavian Lapp conference, at Karasjok, nort Norway, 1956; formation of permanent Scandinavian Lapp council.]

BERGMAN, GÖRAN. Sälbeståndet vid våra kuster. *Nordenskiöld-Samfundets Tidskrif* Årg. 16, 1956, p. 49–65, illus. [Seal stocks and sealing on Finnish coasts, 1924–55.]

ZIMMERMAN, JOHN L. Force in readiness. *United States Naval Institute Proceedings* Vol. 83, No. 2, 1957, p. 164–71, illus. [History of U.S. forces in Iceland during Worl War II.]

BYLUND, ERIK. Koloniseringen av Pite lappmark t.o.m. år 1867. *Geographica*, Nr. 30, 1956 448 p. illus., maps. [Colonization of Pite lappmark, north Sweden, up to 1867. Englis summary. Reviewed by Ingmar Persson in *Svensk Geografisk Årsbok*, Årg. 32, 1956 p. 199–201.]

GAM, M. De samiske kostskoler i Nordsverige. *Atuagagdliutit/Grønlandsposten*, 1956, Nr. 6 p. 5–7. [Lapp boarding schools in north Sweden, studied by Greenland director o education with view to establishing similar schools in Greenland.]

MUSSET, RENÉ. La fabrication de l'azote à partir de l'air en Norvège. *Annales de Géographie* Année 65, No. 350, 1956, p. 316–17. [New centre for nitrogen production established i arctic Norway, 1953.]

ANTARCTIC REGIONS

GOULD, LAURENCE M. Antarctic prospect. *Geographical Review*, Vol. 47, No. 1, 1957 p. 1–28, illus., maps. [History of exploration and geography as background to Inter national Geophysical Year, 1957–58.]

LEBEDEV, VLADIMIR L'VOVICH. *Antarktika* [*The Antarctic*]. Moscow, Gosudarstvennoy Izdatel'stvo Geograficheskoy Literatury [State Publishing House for Geographica Literature], 1957. 192 p. illus., maps. 20 cm. [Physical geography: land ice, sea ice climate, flora and fauna, oceanography.]

[ANTARCTIC : LAWS] Décret no. 56–32 du 13 janvier 1956 fixant le régime financier d territoire des Terres Australes et Antarctiques Françaises. *Journal Officiel*, 14 janvie 1956. [Text of decree promulgating financial arrangements for French Antarcti Territories.]

[ANTARCTIC : LAWS] Restablécese el Territorio Nacional de T. del Fuego, Antártida e Isla del Atlántico Sud. Decreto—Ley No. 2191—Buenos Aires, 28/2/57. *Boletín Oficial d la República Argentina*, 19 March 1957, p. 1–4. [Text of Argentine law re-establishin National Territory of Tierra del Fuego, the Antarctic and South Atlantic Islands, wit administrative capital at Ushuaia.]

SULLIVAN, WALTER. *Quest for a continent.* New York, McGraw-Hill, 1957. [xvi], 373 p illus., maps (one on end-papers). 22 cm. [History of antarctic exploration wit emphasis on United States' activities, 1945–56.]

ERRATA

The *Polar Record*, No. 46, July 1953

Page 755, line 20. *For* 1949 *read* 1948
line 23. *For* 1949–50 *read* 1948–49

The *Polar Record*, No. 55, January 1957

Page 350, line 39. *For* 20 April *read* 8 October

The *Polar Record*, No. 56, May 1957

Page 419, line 17. *For* a Library, *read* and a Library
line 19. *For* a Museum, *read* and a Museum
lines 28, 29. *For* to subsidize...Antarctic *read* to subsidize Antarctic research and investigations, 250,000 for publications, 1,000,000 for expeditions and field work in Antarctic
Page 420, line 28. *For* A. M. Boedo *read* A. Monosco Boedo
Page 446, line 45. *For* G. A. Liljequist *read* G. H. Liljequist
Page 450, line 18. *After* with *insert* the rest of
Page 456, line 1. *Omit* It was...70° W.
Page 457, line 22. *For* 2 *read* 1
line 39. *After* night, *read* They spent 3 January on the Island.
Page 497, line 34. *For* 1901 *read* 1909

The *Polar Record*, No. 57, September 1957

Page 526, line 50. *For* Anvers *read* Detaille
Page 530, line 3. *For* unsuccessful *read* successful.
Page 541, facing No. 11 in key to map. *For* 62° 53′ W *read* 62° 53′ E.
Inset map. No. 14 is shown on Nelson Island but should be on Robert Island.

NOTICES

The *Polar Record* is published in January, May and September each year. Contributions, also books and papers for listing in the bibliography of "Recent Polar Literature", should be addressed to the Editor, Scott Polar Research Institute, Lensfield Road, Cambridge, England.

Every effort is made to enable authors of articles to receive proofs, which they are requested to return without delay. Proofs of notes are not normally submitted to authors, except when especially requested.

Twenty-five reprints of articles are supplied free to authors; additional copies, which are provided at cost price, should whenever possible be requested on submitting the contribution. Reprints of notes are not normally supplied.

Correspondence arising out of notes and articles is welcomed.

The Scott Polar Research Institute is a signatory of the Royal Society's "Declaration on fair dealing in regard to copying from scientific periodicals". Details of the Declaration may be obtained upon application from the offices of the Royal Society, Burlington House, London, W. 1.

The cover of the journal is from a photograph by Hunting Aerosurveys Ltd., taken during the Falkland Islands Dependencies Aerial Surveys Expedition, 1955–57.

PUBLICATIONS FOR SALE AT THE SCOTT POLAR RESEARCH INSTITUTE

Scientific Reports of the Terra Nova expedition, 1910–13

Reports dealing with meteorology, terrestrial magnetism, gravity determination, aurora observations, physiography and miscellaneous data are still available. For a detailed list, and prices, see the inside back cover of the *Polar Record*, No. 44.

Back issues of the Polar Record

A few sets of the *Polar Record*, Volumes 1–5 (Nos. 1–40), including indexes, are available, price £60 at the discretion of the Editorial Committee; also the following separate issues at seven shillings and sixpence each:

Nos. 1, 2, 3, 4, 17, 19, 31, 32, 39 onwards.

Nos. 33/34, 35/36, and 37/38. These are double numbers and are fifteen shillings each.

Indexes for Volume 1 (Nos. 1–8), Volume 2 (Nos. 9–16) and Volume 3 (Nos. 17–24) are five shillings each, the index for Volume 4 (Nos. 25–32) is ten shillings, the index for Volume 5 (Nos. 33/34–40) is free and the indexes to Volume 6 (Nos. 41–46) and Volume 7 (Nos. 47–51) are ten shillings each.

Reprints of "Recent Polar Literature", from Nos. 37/38 onwards, are two shillings and sixpence for two reprints for each issue.

Reprints of "Illustrated Ice Glossary", by Terence Armstrong and Brian Roberts, from Volume 8, No. 52, 1956, are five shillings.

An illustrated descriptive pamphlet entitled *The Scott Polar Research Institute* is two shillings and ninepence.

Prices are subject to alteration without notice.

"FRIENDS OF THE POLAR INSTITUTE"

This association was established in March 1946 with two objects in view: first to provide a means whereby those interested in the promotion of polar exploration and research might assist the Scott Polar Research Institute, and secondly to keep members in touch both with the Institute and with present polar activities. Members receive the Annual Report of the Committee of Management, which describes the work and progress of the Institute, and the Annual Report of the "Friends of the Polar Institute".

The minimum annual subscription is one guinea. British taxpayers who are able to subscribe by covenanted agreement for a period of seven years will be giving additional assistance to the Institute. "Friends" are asked to subscribe separately to the journal of the Institute, the *Polar Record*.

The "Friends" have been the means of giving very valuable help to various sides of the Institute's work. Subscriptions are used principally for making accessions to the Museum and Library, for providing furniture and equipment, and for special needs which cannot be met from other sources.

SUBSCRIPTIONS TO THE *POLAR RECORD*

The *Polar Record* may be obtained direct from the Scott Polar Research Institute, Lensfield Road, Cambridge, England, or through any bookseller. The subscription is thirty-one shillings and sixpence a year, or ten shillings and sixpence a single copy, post free.

PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, CAMBRIDGE
(BROOKE CRUTCHLEY, UNIVERSITY PRINTER)